AMENDMENT OF SOLICITATION/MODIFICATION OF CONTRACT	1. CONTRACT ID CODE J	PAGE 1 of

2. AMENDMENT/MODIFICATION NO.	3. EFFECTIVE DATE	4. REQUISITION/PURCHASE REQ. NO.	5. PROJECT NO. *(If applicable)*
0003	May 17, 2002		Envir. Svcs. West Coast

6. ISSUED BY	SCO600	7. ADMINISTERED BY (*If other than Item 6*) CODE	SCO600
DEFENSE ENERGY SUPPORT CENTER 8725 JOHN J. KINGMAN RD., SUITE 4950 FT. BELVOIR, VA 22060-6222 BUYER/SYMBOL – LMcCANTS/DESC-FPA PHONE - (703) 767-9335 FAX - (703) 767- 9338 Email – lmccants@desc.dla.mil 6.1a			

8. NAME AND ADDRESS OF CONTRACTOR (*NO., street,city,county,State,and ZIP Code*)		9a. AMENDMENT OF SOLICITATION NO.
		9b. DATED *(SEE ITEM 11)*
	X	10a. MODIFICATION OF CONTRACT/ORDER NO. SP0600-02-R-0058
		10b. DATED *(SEE ITEM 13)*

11. **THIS ITEM ONLY APPLIES TO AMENDMENTS OF SOLICITATIONS**

[ ] The above numbered solicitation is amended as set forth in Item 14. The hour and date specified for receipt of Offers [X] is extended, [ ] is not extended
Offers must acknowledge receipt of this amendment prior to the hour and date specified in the solicitation or as amended, by one of the following methods:

(a) By completing Items 8 and 15, and returning ___2____ copies of the amendment; (b) By acknowledging receipt of this amendment on each copy of the offer submitted; or(c) By separate letter or telegram which includes a reference to the solicitation and amendment numbers. **FAILURE OF YOUR ACKNOWLEDGMENT TO BE RECEIVED AT THE PLACE DESIGNATED FOR THE RECEIPT OF OFFERS PRIOR TO THE HOUR AND DATE SPECIFIED MAY RESULT IN REJECTION OF YOUR OFFER.** If by virtue of this amendment you desire to change an offer already submitted, such change may be made by telegram or letter, provided each telegram or letter makes reference to the solicitation and this amendment, and is received prior to the opening hour and date specified.

12. **ACCOUNTING AND APPROPRIATION DATA** *(If required)*

13. THIS ITEM APPLIES ONLY TO MODIFICATIONS OF CONTRACTS/ORDERS, IT MODIFIES THE CONTRACT/ORDER NO. AS DESCRIBED IN ITEM 14.

	A. THIS CHANGE ORDER IS ISSUED PURSUANT TO: *(Specify authority)* THE CHANGES SET FORTH IN ITEM 14 ARE MADE IN THE CONTRACT ORDER NO. IN ITEM 10A.
XX	B. THE ABOVE NUMBERED CONTRACT/ORDER IS MODIFIED TO REFLECT THE ADMINISTRATIVE CHANGES *(such as changes in paying office, appropriation date, etc.)* SET FORTH IN ITEM 14, PURSUANT TO THE AUTHORITY OF FAR 43.103(b)
	C. THIS SUPPLEMENTAL AGREEMENT IS ENTERED INTO PURSUANT TO AUTHORITY OF: MUTUAL AGREEMENT OF THE PARTIES
	D. OTHER *(Specify type of modification and authority)*

E. **IMPORTANT:** Contractor [] is not, [ ] is required to sign this document and return _____ copies to the issuing office.

14. **DESCRIPTION OF AMENDMENT/MODIFICATION** *(Organized by UCF section headings, including solicitation/contract subject matter where feasible.)*

A. The closing date for this solicitation is hereby changed from May 21 to June 4, 2002, 3:00 P.M. local Virginia

B. The solicitation is amended starting on page 2 of this amendment.

C. DD Form 1707, Block 7, delete "Facsimile proposals are authorized (see Clause L2.11-2)."

Except as provided herein, all terms and conditions of the document referenced in Item 9A or 10A, as heretofore changed, remains unchanged and in full force and effect.

15A. NAME AND TITLE OF SIGNER (*Type or print*)	16A. NAME OF CONTRACTING OFFICER
	AMY V. LOAR

The Solicitation is amended as follows:

1. Clause B35, SECTION C – DESCRIPTION/SPECIFICATION is amended as follows:

a. The SCOPE is amended as follows (deleted DFSP Moffett Field):

SCOPE: The environmental service contractor shall conduct Environmental Assessments, Environmental Remediations, and Emergency Responses at the following facilities: DFSP Ozol (Martinez CA), DFSP Norwalk (Norwalk, CA), DFSP San Pedro (San Pedro, CA), and FISC San Diego (Point Loma) (San Diego, CA). In addition to these locations, there is potential for these environmental services to be required at FISC Puget Sound (Manchester, WA) and FISC Pearl Harbor (Pearl Harbor, HI). Based on previous experience, DESC has compiled a list of services that might be needed to respond to an environmental work requirement. Additional control, assessment, or remediation techniques recommended by the contractor may be approved for use on a specific response if the contractor can satisfactorily demonstrate to DESC that the techniques are viable for controlling fuel contamination, cost effective, available "off-the-shelf", and are acceptable to state and federal authorities.

b. Delete TASK 4 SOIL BORINGS. in it's entirety and substitute the following:

TASK 4. SOIL BORINGS. Contractor shall install borings using a hollow stem auger. Take soil samples every 5 feet or whenever a soil change is detected, employing a split spoon sampler. Samples shall be screened by head space analysis using an Organic Vapor Analyzer (OVA) or equal. Drilling equipment shall be steam cleaned before installation of each boring. A geologist or hydrogeologist, working under the direct supervision of a registered geologist, shall be on-site throughout the drilling phase to classify soil conditions encountered, oversee boring installation, prepare boring logs, and monitor grouting of borings. Soil produced in drilling of borings shall be screened, and contaminated soil shall be placed on and covered with PVC sheeting. Non-contaminated soil shall be spread in the vicinity of the work. Disposal of contaminated soil will be authorized under Task 17. Soil handling procedures outlined under this Task are also applicable to all other Tasks where potentially contaminated soil is generated in the form of cuttings or excavation. Analytical laboratory testing of soil samples obtained will be ordered under Task 7.

c. Delete TASK 5 MONITORING WELLS.. in it's entirety and substitute the following:

TASK 5. MONITORING WELLS. Contractor shall install 2" or 4" monitoring wells, as ordered. The monitoring wells shall be installed in accordance with procedures accepted by the State in which work is performed and the USEPA. Drilling equipment shall be steam cleaned before each use. Samples shall be collected using a clean split spoon every 5 feet or whenever a soil change is detected. The headspace of all soil samples shall be analyzed for volatile organic vapors using an OVA or equal. Each well shall be developed to restore the natural permeability of the surrounding formation adjacent to the borehole, and until the water removed is sand free. Water produced in well development shall be collected in drums. Non-contaminated water shall be disposed of on-site in the vicinity of the work. Disposal of contaminated water will be authorized under Tasks 16 and/or 17. The work shall include obtaining one water sample from the well after development, but analytical testing shall be ordered under Task 7. Water handling procedures outlined under this Task shall also be applicable for all other Tasks where water is produced with the exception of Task 11. Well construction shall be performed by personnel who are qualified in the locality in which the work is performed. A geologist or a hydrogeologist working under the direct supervision of a registered geologist shall be present as required in Task 4. Abandonment of existing monitoring wells may also be ordered under this Task.

Abandonment shall be conducted in full compliance with applicable regulatory agency requirements.

d. Delete TASK 6 DIRECT PUSH TESTING. in it's entirety and substitute the following:

TASK 6. DIRECT PUSH TESTING. The Contractor shall use direct push testing procedures for screening or obtaining groundwater and soil samples for analytical testing. One soil sample and one water sample shall be collected from each probe location. Soil samples shall be screened by head space analysis using an OVA. Test probes shall be steam cleaned or otherwise effectively decontaminated after each use. The work includes grouting of bore holes in accordance with regulatory agency procedures. A geologist or hydrogeologist working under the direct supervision of a registered geologist shall be on site throughout the work to prepare logs and monitor grouting. One unit of direct push testing consists of five (5) individual probes. Assume a maximum probe depth of fifty (50) feet.

e. Delete TASK 7 SAMPLE TESTING. in it's entirety and substitute the following:

TASK 7. SAMPLE TESTING. Soil Samples collected under Task 4, 5, and 6 and Groundwater Samples collected under Tasks 5 and 6 shall be tested utilizing the test methods listed below. The types and number of tests to be performed for all Tasks will be determined at the time the work is ordered. In addition to providing "hard copies" of all analytical results, electronic deliverables of results must also be included in the price. Offeror shall provide the normal turnaround time (business days) to obtain results and surcharges for 72 hour and 24 hour expedited turnaround. Sample preparation cost (extractions, dissolution, filtering, etc.) for samples requiring preparation prior to analysis shall be included in the price.

SOILS:

SW-846 METHOD	COMPOUNDS
6010	Total Lead
8015	Non-Halogenated Volatile Organics
8021	Aromatic and Halogenated Volatiles
8041	Phenols
8081	Organochlorine Pesticides & PCE's
8121	Chlorinated Hydrocarbons
8151	Chlorinated Herbicides
8260	Volatile Organics
8270	Semi-volatile organics
8310	Polynuclear Aromatic Hydrocarbons
8440	Total Recoverable Petroleum Hydrocarbons

GROUNDWATER:

40CFR136 METHOD	COMPOUNDS
601	Purgeable Halocarbons
602	Purgeable Aromatics
604	Phenols
608	Organochlorine Pesticides and PCBs
610	Polynuclear Aromatic Hydrocarbons
612	Chlorinated Hydrocarbons
624	Purgeables
625	Base/Neutrals and Acids

SOILS/GROUNDWATER:

TCLP	Lead, Arsenic, Cadmium, Chromium

	Barium, Mercury, Selenium, Silver
9045	pH
1010/1020	Ignitability

f. Delete TASK 12 REMEDIATION, Sub-paragraph e. Bioventing in its'entirty and substitute the following:

"e. Bioventing. Conduct a pilot test to evaluate soil permeability and the ability to move air through the soil, and increase subsurface oxygen concentrations. Specifically:

i. Determine the air permeability and effective radius of influence of injection wells.

ii. Asses biologic uptake of available oxygen, and resulting carbon dioxide production.

iii. Evaluate bioventing as a primary remediation system or to be used with other technologies."

g. Delete TASK 13 SITE OPERATIONS AND MAINTENANCE (O&M). in it's entirety and substitute the following:

TASK 13. SITE OPERATIONS AND MAINTENANCE (O&M): Provide O&M of existing remediation systems at DFSPs Ozol and San Pedro in accordance with the synopsis of O&M manuals attached to this Statement of work.

h. Delete TASK 14 MONITORING. in it's entirety and substitute the following:

TASK 14. MONITORING: Conduct monitoring, sampling, testing, and reporting at DFSPs Ozol and San Pedro in accordance with existing local Regional Water Quality Control Board (RWQCB) approved self-monitoring programs. Details of these programs are included in the synopsis of O&M manuals referenced under TASK 13. The work includes preparation and submittal to the Contracting Officer of one draft copy of any required report. Upon approval by the Contracting Officer prepare and submit one (1) final copy to the RWQCB and two (2) copies to the Contracting Officer. Upon final approval of all monitoring reports for each calendar year, provide the Contracting Officer one (1) CD-R media copy of all monitoring reports for the year to include all documents and correspondence relative to the reports.

i. Delete TASK 15 REPORTS. in it's entirety and substitute the following:

TASK 15. REPORTS. No later than 60 days after completion of any field work and/or receipt of analytical results, the Contractor shall prepare and submit five (5) copies of a report of findings to the Contracting Officer. After the report has been finalized and approved, provide the Contracting Officer one (1) CD-R media copy of the report to include all documents and correspondence relative to the report. The report shall include a description of site conditions and the condition of the soils, surface water, groundwater and any remediation that was accomplished. Proposals shall be based on the assumption that 30 work hours will be required to prepare a completed work plan. Specific enclosures would typically include the following where applicable:

a. Site location map.

b. The geologic description and classification of subsurface soils.

c. Typical geological cross sections.

d. Monitoring well boring logs.

e. Well locations and elevation survey.

f. Groundwater flow map.

g. Sampling QA/QC information.

h. Laboratory analytical results for soil and water samples.

i. Description of any remedial action that was completed.

j. Recommendations for future activities with estimated costs.

j. Delete SPECIAL NOTES: e. in its' entirety and substitute the following:

e. Proposals shall be based on the assumption that all work areas are accessible to rubber tire mounted equipment. Additional compensation will be negotiated under CLINs 0016 and/or 0017 for access to those areas accessible by a tracked vehicle or other specialized equipment.

k. Under the FACILITY DESCRITIONS, delete the description for DFSP Moffett Field in its' entirety.

l. Under the FACILITY DESCRITIONS, for FISC SAN DIEGO (POINT LOMA), add the following:
"OFFSITE FACILITIES INCLUDED IN THIS SOLICITATION: 16.4 mile long – 8" dia pipeline from FISC San Diego to MCAS Miramar, CA.

2. Clause L.201.01.100 SPECIFIC INSTRUCTIONS FOR PREPARING OFFERS

a. Delete paragraph 1. CERTIFICATION PACKAGE in its' entirety and substitute the following:

"1. **CERTIFICATION PACKAGE:** Complete all required representations and certifications, and provide proposed prices in Clause B35. Clause B35 is provided as an EXCEL spreadsheet as part of the solicitation. After filling in the proposed prices, copy the spreadsheet on to CD-R media and submit the CD-R as part of the Certification package along with a printed out hard copy. Prices proposed must be based on description of tasks as stated in the Statement of Work."

b. For the Sample Scenario, revise the first sentence of sub-paragraph (5) GROUNDWATER as follows: "Results for the most recent analysis of groundwater samples taken from the upper aquifer from a total of 13 wells are as follows:".

c. Sub-paragraph (d) Project Manager experience. In addition to the number of assessments, remediations, and emergency responses provide the following information for a maximum of three (3) petroleum contamination site closures: project/contract name, location, client and/or regulatory agency point of contact.

d. Sub-paragraph (f) is deleted in its' entirety and replaced with the following:
"(f) Provide a detailed breakdown of the level of effort needed to review all existing environmental reports generated for the sites to be included in this contract, based on the following:

FISC Point Loma: Review is limited to the reports available at DFSP San Pedro which essentially consists of assessment and remediation reports for work performed during the past two (2) years.

DFSP Norwalk: All available reports are located at DFSP San Pedro.

DFSP San Pedro: All available reports are located at DFSP San Pedro.

DFSP Ozol: A list of reports is attached. The majority of these reports are available at DFSP San Pedro, all of the reports are available at Fort Belvoir, VA."

3. Clause M28.04.100 BASIS FOR AWARD: The estimated quantities under sub-paragraph (b) (3) are deleted in their entirety and replaced with the following::

ESTIMATED QUANTITIES (YEAR 1)

Contract Line Item Number	Services	Pt. Loma Quantity	Norwalk Quantity	Ozol Quantity	San Pedro Quantity
0001A	Work Plan	2	4	2	4
0001B	Work Plan Excess Hours	150	60	100	80
0002A	Soil Gas Units - 4 foot depth	0	0	4	0
0002B	Soil Gas Units - 14 feet depth	0	0	4	0
0002C	Soil Gas Survey Mobilizations	0	0	1	0
0003A	Geophysical Survey Units	1	0	0	1
0004A	Boring up to 5 feet	5	5	20	20
0004B	Feet of Boring 6 to 20 feet	75	75	300	300
0004C	Feet of Boring 21 to 60 feet.	200	200	800	800
0004D	Feet of Boring 61 to 150 feet.	0	450	100	1400
0004C	Mobilizations for Soil Borings	1	1	2	2
0005A	2" Monitoring Well up to 10 feet	2	0	3	0
0005B	Feet of 2" Well 11 to 20 feet	20	0	30	0
0005C	Feet of 2" Well 21 to 60 feet.	80	0	120	0
0005D	Feet of 2" well 61 to 150 feet.	0	0	50	0
0005E	4" Monitoring Well up to 10 feet	5	5	5	10
0005F	Feet of 4" Monitoring Well 11 to 20 feet	50	50	50	100
0005G	Feet of 4" Well 21 to 60 feet	200	200	200	400
0005H	Feet of 4" Well 61 to150 feet	180	450	400	900
0005I	Feet of Closing/Abandoning 2" dia. Well	50	50	75	25
0005J	Feet of Closing/Abandoning 4" dia. Well	50	75	100	30
0005K	Mobilizations for Monitoring Wells.	2	2	2	2
0006A	DPT Units – 50 foot depth	2	2	1	2
0006B	Mobilization for DPT Testing	1	1	1	1
0007	Analytical Testing:				
0007A	6010	100	10	10	10
0007B	8015	100	90	100	130
0007C	8021	90	90	50	60
0007D	8041	0	0	0	0
0007E	8081	0	10	10	0

0007F	8121	0	0	0	0
0007G	8151	0	10	10	15
0007H	8260	150	75	75	50
0007I	8270	10	0	10	15
0007J	8310	25	25	10	10
0007K	8440	25	25	20	10
0007L	601	50	0	30	25
0007M	602	50	0	30	50
0007N	604	10	0	5	5
0007O	608	0	5	5	5
0007P	610	5	10	5	5
0007Q	612	3	0	0	0
0007R	624	5	5	5	5
0007S	625	0	0	0	0
0007T	TCLP	5	10	10	5
0007U	9045	0	10	15	0
0007V	1010/1020	2	2	2	2
0008	Well Location Surveying Units	2	2	2	2
0009A	6" Recovery Wells up to 10 Feet	2	0	1	1
0009B	Feet of 6" Recovery Well 11 to 20 Feet	10	0	10	10
0009C	Feet of 6" Recovery Well 21 to 60 Feet	0	0	40	40
0009D	Feet of 6" Recovery Well from 61 to 120 Feet	0	0	40	0
0009E	Mobilizations for 6" Recovery Well.	1	0	1	1
0009F	Months of 6" Recovery Well O&M	12	0	12	12
0009G	Install Pump System on Exst'g 4" Well	1	0	1	0
0009H	Mobilizations for Pump Install on Exst'g 4" Well	1	0	1	0
0009I	Months of 4" Recovery Well O&M	12	0	12	0
0010A	Units of Recovery Trench Installation	1	0	0	1
0010B	Mobilizations for Recovery Trench Installation	1	0	0	1
0010C	Months of Recovery Trench O&M	8	0	0	12
0011	Pump Tests	1	0	1	1
0012AA	Vapor Extraction System Feasibility Study/Pilot Tests	1	0	0	1
0012AB	Hours for Development of System Documentation	100	0	0	100
0012BA	Bioremediation SystemFeasibilty Study	0	0	1	0
0012BB	Hours for Development of System Documentation	0	0	400	0
0012CA	Air Stripper Pilot Test	1	0	0	0
0012CB	Hours for Development of System Documentation	100	0	0	0
0012DA	Liquid Phase Carbon Adsorption System	1	0	0	1
0012DB	Hours for Development of System Documentation	75	0	0	50
0012EA	Bioventing Pilot Test	0	0	0	1
0012EB	Hours for Development of System Documentation	0	0	0	90
0012FA	Air Sparge Pilot Test	0	1	1	0
0012FB	Hours for Development of System				

	Documentation	0	200	150	0
0012GA	Steam Injection Bench Scale Test	1	0	0	0
0012GB	Hours for Development of System Documentation	200	0	0	0
0012HA	Bioslurp Pilot Test	0	0	1	0
0012HB	Hours for Development of System Documentation	0	0	250	0
0013A	Ozol Monthly O&M	N/A	N/A	12	N/A
0013B	San Pedro Monthly O&M	N/A	N/A	N/A	12
0014A	Ozol Annual Monitoring/Reporting	N/A	N/A	1	N/A
0014B	San Pedro Annual Monitoring/Reporting	N/A	N/A	N/A	1
0015A	Reports	4	2	4	4
0015B	Excess Hours for Report Preparation	400	50	200	200
0016A	Project Manager Hours	500	200	300	600
0016B	Engineer I Hours	1500	500	500	200
0016C	Engineer II Hours	200	400	100	240
0016D	Engineer III Hours	100	100	50	200
0016E	Chemist Hours	50	0	40	80
0016F	Environmental Scientist I Hours	100	200	150	100
0016G	Environmental Scientist II Hours	50	100	40	10
0016H	Environmental Scientist III Hours	30	50	20	100
0016I	Geologist I Price Hours	250	100	80	120
0016J	Geologist II Hours	100	200	40	160
0016K	Geologist III Price Hours	50	100	40	200
0016L	Hydrogeologist I Hours	50	80	40	80
0016M	Hydrogeologist II Hours	25	100	0	100
0016N	Hydrogeologist III Hours	25	150	0	120
0016O	Toxicologist I Hours	30	0	40	60
0016P	Toxicologist II Hours	20	0	0	80
0016Q	Toxicologist III Hours	10	8	8	75
0016R	Drafter Hours	200	40	160	220
0016S	Traffic Control Engineer Hours	80	0	0	40
0016T	Cost Accountant Hours	200	200	160	160
0016U	Secretary Hours	250	260	200	250
0016V	Site Labor Foreman Hours	500	300	200	300
0016W	Remediation System Operator Hours	2080	0	0	0
0016X	Heavy Equipment Operator Hours	80	190	120	180
0016Y	Laborer Hours	1000	600	800	1300
0016Z	Drill Rig Operator Hours	40	40	80	130
0016AA	Engineering Technician Hours	1000	1300	800	1600
0016AB	Utility Truck Days	30	130	30	70
0016AC	02/Explosimeter Days	200	100	50	160
0016AD	Sampling Pump Days	20	40	16	40
0016AE	Flame Ionization OCA Days	30	60	0	40
0016AF	Air Velocity Meter Days	20	10	0	30
0016AG	Field GC Days	10	5	0	10
0016AH	DOT Approved 55 Gal Drums	200	25	40	280
0016AI	Ship 25lb Units of Soil and Water Samples	25	2	2	2
0016AJ	Disposable Bailers	100	30	30	30

0016AK	500 CFM Thermal Oxidizer Months	3	0	0	3
0016AL	Tedlar Bags (dozen)	10	10	10	10
0016AM	Pickup Truck (1/2 ton) Days	100	100	100	100
0016AN	1 CY Backhoe Loader Days	10	10	10	10
0016AO	1 1/2 CY Hydraulic Excavator Days	0	10	0	15
0016AP	Drill Rig Days	10	5	10	28
0016AQ	Dewatering Pump (150 GPM) Days	5	0	0	30
0016AR	Air Compressor (7 cfm) Days	5	5	5	18
0016AS	Generator (4000 watt) Days	5	0	5	20
0016AT	CAD Equipment Use Charge Days	10	5	5	15
0016AU	Photoionization Detector Days	25	30	0	45
0017	Other Direct Costs (Dollars x 1000)*	200	100	200	150
	* Cost evaluation will be made using dollar figure shown times the percent of overhead and profit provided by the Offeror in Contract Line Item 0017 of **Clause B35 SERVICES TO BE PROVIDED AND PRICES**.				

4. In the OFFEROR SUBMISSION PACKAGE, delete Clause B35 SERVICES TO BE FURNISHED AND PRICES in its'entirety and substitute the following:

B35 SERVICES TO BE FURNISHED AND PRICES

Contract Line Item Number	Services	Point Loma	Norwalk	Ozol	San Pedro
0001	**Develop a Detailed Work Plan IAW Task 1 of the SOW.**				
0001A	**Lump Sum Price for Work Plan**	**$**	**$**	**$**	**$**
0001B	**Unit Price per Hour in Excess of Those Included in Lump Sum**	**$**	**$**	**$**	**$**
0002	**Conduct Soil/Gas Survey IAW Task 2 of SOW**				
0002A	**Price per Unit (10 points/unit) - 4 Foot Depth**	**$**	**$**	**$**	**$**
0002B	**Price per Unit (10 points/unit) - 14 Foot Depth**	**$**	**$**	**$**	**$**
0002C	**Soil/Gas Survey Mobilization Cost**	**$**	**$**	**$**	**$**
0003	**Conduct Geophysical Survey IAW Task3 of SOW.**				
0003A	**Price per Unit (10,000 linear feet) to Include 5 Copies of a Report of Findings.**	**$**	**$**	**$**	**$**
0004	**Locate, Install and Sample Soil Borings IAW Task 4 of the SOW**				

0004A		Price per Boring up to 5 Feet	$	$	$	$
0004B		Cost per Foot From 6 to 20 Feet	$	$	$	$
0004C		Cost per Foot From 21 to 60 Feet.	$	$	$	$
0004D		Cost per Foot From 61 to 150 Feet	$	$	$	$
0004E		Mobilization Cost for Soil Borings	$	$	$	$
0005		Locate, Install and Sample Monitoring Wells IAW Task 5 of SOW				
0005A		Price per 2" Well up to 10 Feet	$	$	$	$
0005B		Cost per Foot of 2" Well From 11 to 20 Feet	$	$	$	$
0005C		Cost per Foot of 2" Well From 21 to 60 Feet.	$	$	$	$
0005D		Cost per Foot of 2" Well From 61 to 150 Feet.	$	$	$	$
0005E		Price per 4" Well up to 10 Feet	$	$	$	$
0005F		Cost per Foot of 4" Well From 11 to 20 Feet	$	$	$	$
0005G		Cost per Foot of 4" Well From 21 to 60 Feet	$	$	$	$
0005H		Cost per Foot of 4" Well From 61 to150 Feet	$	$	$	$
0005I		Cost per Foot to Close/Abandon 2" dia. Well	$	$	$	$
0005J		Cost per Foot to Close/Abandon 4" dia. Well	$	$	$	$
0005K		Mobilization Cost for Monitoring Wells	$	$	$	$
0006		Conduct Direct Push Testing IAW Task 6 of the SOW.				
0006A		Cost per Unit of DPT (5 bores per unit)	$	$	$	$
0006B		Mobilization Cost for Direct Push Testing.	$	$	$	$
0007		Conduct Analytical Testing, Cost per Test for the Following Procedures:				
0007A	6010		$	$	$	$
0007B	8015		$	$	$	$
0007C	8021		$	$	$	$
0007D	8041		$	$	$	$
0007E	8081		$	$	$	$
0007F	8121		$	$	$	$
0007G	8151		$	$	$	$
0007H	8260		$	$	$	$
0007I	8270		$	$	$	$
0007J	8310		$	$	$	$

0007K	8440	$	$	$	$
0007L	601	$	$	$	$
0007M	602	$	$	$	$
0007N	604	$	$	$	$
0007O	608	$	$	$	$
0007P	610	$	$	$	$
0007Q	612	$	$	$	$
0007R	624	$	$	$	$
0007S	625	$	$	$	$
0007T	TCLP Metals	$	$	$	$
0007U	9045	$	$	$	$
0007V	1010/1020	$	$	$	$
0008	Performing Monitoring Well Survey IAW TASK 8 of the SOW (10 Wells/Unit)	$	$	$	$
0009	Install and Maintain Recovery Well IAW Task 9 of the SOW				
0009A	Price per 6" Recovery Well up to 10 Feet Deep (including water table depression and free product recovery pump)	$	$	$	$
0009B	Cost per Foot of 6" Recovery Well From 11 to 20 Feet	$	$	$	$
0009C	Cost per Foot of 6" Recovery Well From 21 to 60 Feet	$	$	$	$
0009D	Cost per Foot of 6" Recovery Well From 61 to 120 Feet	$	$	$	$
0009E	Mobilization Cost for 6" Recovery Well.	$	$	$	$
0009F	Monthly Price for Operation and Maintenance of 6" Recovery Well and Pump System.	$	$	$	$
0009G	Cost of Installing Water Table Depression and Free Product Recovery Pump System on a 4" Monitoring Well.	$	$	$	$
0009H	Mobilization Cost for 4" Recovery Pump System.	$	$	$	$
0009I	Monthly Price for Operation and Maintenance of 4" Recovery Well	$	$	$	$
0010	Install and Maintain Recovery Trench System IAW Task 10 of the SOW				
0010A	Lump Sum Price per Unit of Recovery Trench System, Including Free Product Recovery and Water Table Depression Pump.	$	$	$	$
0010B	Mobilization Cost for Trench Construction and Recovery Pump System Installation.	$	$	$	$

0010C	Monthly Cost for Operation and Maintenance of RecoveryTtrench System.	$	$	$	$
0011	Lump Sum Price to Conduct Pump Test IAW Task 11 of the SOW	$	$	$	$
0012	Perform remediation feasibility tests and studies IAW Task 12 of the SOW.				
0012A	Vapor Extraction System				
0012AA	Lump Sum Price for Feasibility Study and Pilot Test	$	$	$	$
0012AB	Price per Hour for Development of System Documentation	$	$	$	$
0012B	Bioremediation System				
0012BA	Lump Sum Price for Feasibilty Study	$	$	$	$
0012BB	Price per Hour for Development of System Documentation	$	$	$	$
0012C	Air Stripper				
0012CA	Lump Sum Price for Pilot Test	$	$	$	$
0012CB	Price per Hour for Development of System Documentation	$	$	$	$
0012D	Liquid Phase Carbon Adsorption System				
0012DA	Lump Sum Price for System Development.	$	$	$	$
0012DB	Price per Hour for Development of System Documentation	$	$	$	$
0012E	Bioventing				
0012EA	Lump Sum Price for Pilot Test	$	$	$	$
0012EB	Price per Hour for Development of System Documentation	$	$	$	$
0012F	Air Sparging				
0012FA	Lump Sum Price for Pilot Test	$	$	$	$
0012FB	Price per Hour for Development of System Documentation	$	$	$	$
0012G	Steam Injection				

0012GA	Lump Sum Price for System Evaluation	$	$	$	$
0012GB	Price per Hour for Development of System Documentation	$	$	$	$
0012H	Bioslurping				
0012HA	Lump Sum Price for Pilot Test	$	$	$	$
0012HB	Price per Hour for Development of System Documentation	$	$	$	$
0013	Operation and Maintenance IAW Task 13 of the SOW				
0013A	Ozol O&M Price per Month	N/A	N/A	$	N/A
0013B	San PedroO&M Price per Month	N/A	N/A	N/A	$
0014	Monitoring and Reporting IAW Task 14 of the SOW				
0014A	Ozol Annual Monitoring/Reporting	N/A	N/A	$	N/A
0014B	San Pedro Annual Monitoring/Reporting	N/A	N/A	N/A	$
0015	Provide a Report of Findings IAW Task 15 of the SOW				
0015A	Lump Sum Price for Report Preparation, Duplication, and Distribution	$	$	$	$
0015B	Unit Price per Hour in Excess of Those Included in Lump Sum.	$	$	$	$
0016	Miscellaneous Services IAW Task 16 of the SOW.				
0016A	Project Manager Price per Hour	$	$	$	$
0016B	Engineer I Price per Hour	$	$	$	$
0016C	Engineer II Price per Hour	$	$	$	$
0016D	Engineer III Price per Hour	$	$	$	$
0016E	Chemist Price per Hour	$	$	$	$
0016F	Environmental Scientist I Price per Hour	$	$	$	$
0016G	Environmental Scientist II Price per Hour	$	$	$	$
0016H	Environmental Scientist III Price per Hour	$	$	$	$
0016I	Geologist I Price per Hour	$	$	$	$
0016J	Geologist II Price per Hour	$	$	$	$

0016K	Geologist III Price per Hour	$	$	$	$
0016L	Hydrogeologist I Price per Hour	$	$	$	$
0016M	Hydrogeologist II Price per Hour	$	$	$	$
0016N	Hydrogeologist III Price per Hour	$	$	$	$
0016O	Toxicologist I Price per Hour	$	$	$	$
0016P	Toxicologist II Price per Hour	$	$	$	$
0016Q	Toxicologist III Price per Hour	$	$	$	$
0016R	Drafter Price per Hour	$	$	$	$
0016S	Traffic Control Engineer per Hour	$	$	$	$
0016T	Cost Accountant Price per Hour	$	$	$	$
0016U	Secretary Price per Hour	$	$	$	$
0016V	Site Labor Foreman Price per Hour	$	$	$	$
0016W	Remediation System Operator Price per Hour	$	$	$	$
0016X	Heavy Equipment Operator Price per Hour	$	$	$	$
0016Y	Laborer Price per Hour	$	$	$	$
0016Z	Drill Rig Operator Price per Hour	$	$	$	$
0016AA	Engineering Technician Price per Hour	$	$	$	$
0016AB	Utility Truck Price per Day	$	$	$	$
0016AC	02/Explosimeter Price per Day	$	$	$	$
0016AD	Sampling Pump Price per Day	$	$	$	$
0016AE	Flame Ionization OCA Price per Day	$	$	$	$
0016AF	Air Velocity Meter Price per Day	$	$	$	$
0016AG	Field GC Price per Day	$	$	$	$
0016AH	Furnish and Fill with Soil or Water DOT Approved 55 gal Drum, Price per Drum	$	$	$	$
0016AI	Shipping of Soil and Water Samples for Analytical Testing Price per 25lb Shipping Container	$	$	$	$
0016AJ	Disposable Bailers	$	$	$	$

0016AK	500 CFM Thermal Oxidizer Price per Month	$	$	$	$
0016AL	Tedlar Bags Price per Dozen	$	$	$	$
0016AM	Pickup Truck (1/2 ton) Price per Day	$	$	$	$
0016AN	1 CY Backhoe Loader Price per Day	$	$	$	$
0016AO	1 1/2 CY Hydraulic Excavator Price per Day	$	$	$	$
0016AP	Drill Rig Price per Day	$	$	$	$
0016AQ	Dewatering Pump (150 GPM) Price per Day	$	$	$	$
0016AR	Air Compressor (7 cfm) Price per Day	$	$	$	$
0016AS	Generator (4000 watt) Price per Day	$	$	$	$
0016AT	CAD Equipment Use Charge Price per Day	$	$	$	$
0016AU	Photoionization Detector Price per Day	$	$	$	$
0017	OtherDirect Costs for Cost Reimbursable Services, Materials, or Supplies (Percent Mark-up for Overhead and Profit)	%	%	%	%

5. Following are responses to questions that were received prior to May 3, 2002. Copies of these questions and answers were made available to attendees at the pre-proposal site visits held May 6 thru 8, 2002.

SOLICITATION No. SPO600-02-R-0058
RESPONSES TO QUESTIONS RECEIVED PRIOR TO MAY3, 2002

1. For the mobilization line items for soil borings, well installation, and direct push investigations, should we include the time necessary for the geologist to travel to the site to pre-mark the locations prior to the field work? Pre-marking is required to be done several days before the actual field work to give the facility folks time to screen the location. Or should we assume that the pre-marking cost will be reimbursed under CLIN 0016?
ANSWER: Premarking along with other tasks which may be necessary prior to actual field work, such as existing utility locates, should not be included in mobilization line items. This work will be negotiated and authorized under Contract Line Items 0016 and/or 0017.

2. On Tasks 4, 5, and 6, the requirement specifies that a registered geologist oversee the installation of the borings and wells. More typically, a geologist working under the direct supervision of a registered geologist is satisfactory. This change would lower the overall cost of the proposed prices for this CLIN.
ANSWER: The intent of the Task Descriptions for all Contract Line Items in the Solicitation is that all work be performed by qualified personnel to comply with applicable Federal, State, and Local regulations. The amount of oversight provided by the registered geologist must be sufficient to enable the registered geologist to certify reports which document the work .

3. For the DPT Task 6, what depth should we assume as the maximum of the holes?
ANSWER: Assume a maximum depth of 50 feet.

4. For the O&M Task 13, should we assume that the laboratory, material, and other direct costs (vacuum trucks, filters, carbon, etc.) will be reimbursed under the appropriate CLINs 0007, 0016, and 0017?
ANSWER: The prices proposed under Contract Line Item 0013 for Operations and Maintenace are to include the cost of all labor, material, equipment, supplies, and services for which quantities can reasonably be inferred from the task description

provided as part of this solicitation. As part of the proposal, Offerors should list any items that they have NOT included in their price.

5. For the sampling and monitoring Task 14, should we assume that the laboratory, material, and other direct costs (vacuum trucks, bailers, etc.) will be reimbursed under the appropriate CLINs 0007, 0016, and 0017?
ANSWER: The prices proposed under Contract Line Item 0014 for Sampling and Monitoring are to include the cost of all labor, material, equipment, supplies, and services for which quantities can reasonably be inferred from the task description provided as part of this solicitation. As part of the proposal, Offerors should list any items that they have NOT included in their price.

6. For Task 14, Monitoring, for the Norwalk site, should we include the 4 quarters of monitoring at the El Toro Pipeline release site in our quotation? Or is the monitoring task only for the two semi-annual events at Norwalk?
ANSWER: Contract Line Item 0014A Norwalk Annual Monitoring and Sampling and Contract Line Item 0013A Norwalk O&M Price per Month are being deleted from this Solicitation. Performance of these services will be negotiated with the successful Offeror after contract award using other appropriate Contract Line Items (e.g. CLINs 0007, 0015, 0016, and 0017).

7. Task 13 of the referenced solicitation requires pricing for the O&M of the San Pedro, Norwalk, and Ozol sites. Although I haven't reviewed the O&M manuals for Ozol yet, I have worked through the documentation available at San Pedro for the Norwalk and San Pedro sites. This documentation provides information on how to run the system and equipment manufacturers requirements for routine maintenance. Further, there is adequate detail to estimate the required frequency of permit-required sampling. My concern is that the remediation systems are dynamic, and that the level of effort needed to keep the systems running in optimal condition varies day in and day out. What I mean by optimal condition is maximum mass removal. It would be easy to expend an extremely low level of effort (as low as just a few hours a week) to keep the systems running and in compliance. This can be done, and I have seen this done countless time on other projects, where the contractor maintains an extremely low water flow rate through the system and minimizes the concentration of vapors running through the treatment system. But clearly, this approach does not meet the real objective of cleaning the site up in the shortest time possible and at a reasonable cost. Providing more guidance as to what should be included in our proposal for the O&M line item, or alternatively, removing the CLIN from the RFP would be advantageous to both the government and the bidding contractors.
ANSWER: The prices proposed under Contract Line Item 0013 for Operations and Maintenance are to include the cost of all labor, material, equipment, supplies, and services for which quantities can reasonably be inferred from the task description provided as part of this solicitation. As part of the proposal, Offerors should list any items that they have NOT included in their price. As noted in the answer for question No. 6, CLIN 0013A Operation and Maintenance of the DFSP Norwalk Site is being deleted from this Solicitation.

8. For Task 1, Preparation of work plans, we are told to assume that 30 hours will be required to prepare a completed workplan. However, on Task 15, Preparation of Reports, I did not see where any guidance was provided as to how many hours we should assume for preparation of a report. Will you provide a number of hours for us to base our estimate on?
ANSWER: Assume 30 hours of effort for the basic report unit in Contract Line Item 0015A.

9. Sample Scenario (page 92) – Are the analytical results described under Section (5) indicative of conditions in the shallow water-bearing zone, or do they also represent conditions in the lower water-bearing zone?
ANSWER: Analytical results are for the shallow aquifer; no water quality data has been obtained for the deep aquifer.

10. Task 7 Sample Testing (page 5) – Method 418.1 requested for TPH involves Freon extraction, which is no longer permitted for use in California. Will DESC specify another analysis for TPH?
ANSWER: Specified analyses in Task 7 will be revised to reflect current test methods. The revision will be included in an amendment to the solicitation that will be issued 7 to 10 days after the conclusion of the site visits.

11. Task 13 Site Operations and Maintenance (page 8) – Should waste disposal and other variable costs (electrical service, telephone, and water) be included in the monthly cost?

ANSWER: The prices proposed under Contract Line Item 0013 for Operations and Maintenance are to include the cost of all labor, material, equipment, supplies, and services for which quantities can reasonably be inferred from the task description provided as part of this solicitation. As part of the proposal, Offerors should list any items that they have NOT included in their price. Electricity and water will be provided by the Government at no cost to the contractor.

12. Does DESC require signature and submittal of the modifications to the original solicitation?
ANSWER: Amendments to the Solicitation are to be acknowledged in Block 14 of Standard Form 33, Solicitation, Offer, and Award.

13. The selection criteria (Page 94-95) do not include any mention of the offeror's accounting system or an evaluation of that information. How will the information provided under L.201.01.100, Item 2. (I) and Item 5 be evaluated?
ANSWER: As noted in Clause G17.01 (Page 17 of the Solicitation), the contractor's accounting system will be evaluated by the Contracting Office to ascertain whether it is in compliance with acceptable accounting practices. The accounting system will either be approved or disapproved. If the offeror's accounting system is in accordance with the Cost Accounting Standards and the offeror provides a copy of the Disclosure Statement on file with DCAA, or a point of contact within DCAA, the accounting system is automatically approved.

14. What is the difference between the proposal information requested under Clause L201.01.100 Paragraph 2(i) and Paragraph 5 Contractor's Accounting System (Page 93-94)?
ANSWER: There is no difference, this was an unintentional duplication. The written disclosure called for under these paragraphs only needs to be submitted once.

15. The selection factors (Page 95) are presented in descending order in the RFP, but can you tell the offerors what the relative weights of the evaluation factors are?
ANSWER: Other than the order of importance of the evaluation factors, other details of the evaluation plan will not be released.

16. How should the offerors consider the potential locations of Washington and Hawaii in their proposals? Will an offeror's prior experience and/or presence in these locations be factored into the contract evaluation?
ANSWER: Experience or presence in Washington or Hawaii do not factor into the evaluation of offers for contract awards at the four sites in California.

17. Which DESC and other agency contracts are currently being utilized to perform similar services to the required RFP services at the DFSPs described in the RFP? Who are the current contract holders?
ANSWER: a. DFSP San Pedro environmental services are currently being provided by the IT Corp under DESC Contract No. SPO600-98-C-5839.
b. DFSP Norwalk environmental services are currently being provided by the IT Corp under DESC Contract No. SPO600-98-C-5842.
c. DFSP Ozol environmental services are currently being provided by the IT Corp under DESC Contract No. SPO600-98-C-5838.
d. FISC San Diego environmental assessment and remediation services have most recently been provided by the IT Corp. under contract vehicles managed by the Omaha and Nashville Districts of the Corps of Engineers.

18. When and how will offeror questions which arise less than 14 days before the site walks be addressed by DESC?
ANSWER: All questions received prior to the site walks will be answered at the site walks. Additionally, these questions plus any questions asked at the site walks will be answered as part of an amendment to the solicitation that will be issued 7 to 10 days following the site walks.

19. Should the Offeror Submission Package be submitted with the proposal as a single informational item, or should the information be organized in accordance with the evaluation criteria?

ANSWER: Offers should be submitted in accordance with the directions in Clause L.201.01.100 Specific Instructions for Preparing Offers.

20. The list of reports for DFSP Ozol was to have been attached to the RFP but was missing (Page 92, Item (f)). When will this information be provided to the offerors?
ANSWER: This list was added to the Solicitation package on the DESC web site on April 24, 2002.

21. Does DESC need to see the build-up of proposed OH&P mark-ups for CLIN 0017 (Page 93, Item (h))?
ANSWER: No, only the actual percentage must be provided .

22. Is there a desired presentation format for the information requested for the Socioeconomic Plan(Page 94, Item 4)?
ANSWER: There is no format preference

23. Are the offeror's unit/hourly prices provided by line item in Section B intended to cover the entire 5-year contract ordering period (annual escalation is built into the unit rates)(Section B, Prices/Costs)?
ANSWER: While it is preferred that the offered prices cover the entire contract period, Offerors are free to propose with an annual escalation factor.

24. Is task order/delivery order modification allowable beyond the 5-year base contract ordering period? If so, for what period of time?
ANSWER: No, task order/delivery order modifications are not allowed beyond the contract period.

25. Are the estimated quantities provided in Section M a best representation of the workload required for Year 1 (recognizing that the Government does not guarantee these quantities)? Can the Government provide additional detail for Years 2 through 5? Is there an upper limit to the contract?
ANSWER: Estimated quantities are for the first year of the contract. Work in subsequent years is largely dependent on the amount of work actually accomplished in the first year plus events which cannot be predicted, e.g. spills. There is neither a guarantee of minimum work nor a ceiling on the maximum amount of work to be awarded under the contract.

26. Many of the analytical methods listed have been deleted from SW-846. SW8010 and SW8020 have been replaced by SW8021. SW8040 has been replaced by SW8141; SW8080 replaced by SW8081; SW8120 replaced by 8121; SW8150 replaced by SW8151. SW8240 and SW8250 have been deleted with no replacement. SW8260 and SW8270 are equivalent methods to SW8240 and SW8250. Should the offeror provide pricing on the replacement methods? How should methods deleted with no replacement provided be priced, if at all (Page 5, Task 7)?
ANSWER: Specified analyses in Task 7 will be revised to reflect current test methods. The revision will be included in an amendment to the solicitation that will be issued 7 to 10 days after the conclusion of the site visits.

27. An Electronic Data Deliverable (EDD) is required. What format is required by DESC (Page 5, Task 7)?
ANSWER: The format must be compatible with Microsoft Excel and Microsoft Access.

28. There is no mention of data validation for laboratory sample analysis. Is data validation required? If so, what criteria shall analyses be evaluated against? The National Functional Guidelines (Page 5, Task 7)?
ANSWER: The California Regional Water Boards are the lead regulatory agencies for assessment and remediation at San Pedro, Norwalk, San Diego, and Ozol. Analytical labs and the procedures used for data validation must be satisfactory to the Regional Water Boards.

29. A "Work Plan" will be prepared. Do facility-specific Sampling and Analysis Plans (SAPs), Quality Assurance Project Plans (QAPPs), etc. exist? If so, is the "Work Plan" referenced under this task is to be a site/project-specific document that builds upon these facility documents? Is the offeror's pricing to be based on the assumption that regulatory agencies will not offer comments on the Work Plan, and that only one iteration will be required (i.e., 30 work hours are referenced in the solicitation) (Page 3, Task 1)?

ANSWER: The Work Plans that may be ordered under this contract would be project and site specific. The price offered should be based on 30 composite hours of the disciplines typically involved in preparing a work plan, i.e. a mix of clerical, technical, and management time. The make-up of the "mix" is naturally dependent on the company specific process the individual Offeror typically employs to prepare work plans. Negotiations to prepare a specific Work Plan could result in multiple Work Plan units being authorized to prepare a complex work plan.
Work Plans are of course subject to revision based on regulatory agency review. In our experience with the regulatory agencies involved in the sites included in this solicitation, the review comments have been minor and were addressed in a simple follow up letter. The contractor is always free to request an adjustment to the terms of the delivery order if more extensive efforts are required.

30. Are QC samples required to be collected during sampling events (i.e. trip blanks, field duplicates, equipment blanks, field blanks, matrix spike and matrix spike duplicates)? If so, at what frequency (Page 5, Task 7)?
ANSWER: QC requirements should conform to the Offeror's quality control plan and must be satisfactory to the regulatory agency providing oversight (Regional Water Quality Control Board).

31. Is this task intended to only include surveying of new wells (i.e., no existing site features will require surveying) (Page 6, Task 8)?
ANSWER: It is conceivable that existing wells might need to be re-surveyed.

32. The scope indicates that pumping shall be performed for a minimum of 8 hours. How will additional level of effort be accommodated in the event that steady state conditions have not been achieved at 8 hours (i.e., additional pumping/time will be required to adequately evaluate aquifer conditions) (Page 6, Task 11)?
ANSWER: Changes to the procedures necessitated by site specific conditions will be negotiated and authorized usng Contract Line Items 0016 and/or 0017.

33. Bioventing. The scope of work does not indicate that pilot tests are to be conducted. Is the referenced evaluation to be performed without pilot test data (Page 6, Task 12)?
ANSWER: A pilot test is required in order to perform the specified evaluation.

34. Steam Injection. Is the laboratory analysis to include bench scale studies, or only soil parameter testing (Page 6, Task 12)?
ANSWER: The laboratory analysis should include a bench scale test.

35. The statement of work for this task requires that O&M be performed "in accordance with O&M manuals provided by the Government". Will these manuals be provided to offerors during the proposal phase, or only after contract award (Page 8, Task 13)?
ANSWER: A complete set of O&M manuals will be provided to the successful Offeror after contract award. Copies are available for review during the Solicitation process. The price proposed for O&M should be based on the synopsis of the O&M manual which will be issued by amendment as part of the Solicitation.

36. For Task 15, Reports is the offeror's pricing to be based on the assumption that regulatory agencies will not offer comments on any given report, and that only one iteration will be required? Should chemical data validation be included in the level of effort for this task (Page 8, Task 15)?
ANSWER: Reports are subject to revision based on regulatory agency review. In our experience with the regulatory agencies involved in the sites included in this solicitation,t he review comments have been minor and were addressed in a simple follow up letter. The contractor is always free to request an adjustment to the terms of the delivery order if more extensive efforts are required.

37. What depth are the groundwater sample results from? The shallow zone (25 feet bgs) or deep zone (90 feet bgs) (Page 91, Sample Scenario)?
ANSWER: Analytical results are for the shallow aquifer, no water quality data has been obtained for the deep aquifer.

38. Does DESC prefer a single PM responsible for the program/contract, or multiple PMs based on workload, location of work, technical requirements, etc.? If the offeror proposes multiple Project Managers (PMs), is the proposal requirement for 30 projects (15 assessment, 10 remediation, 5 response) applicable to an individual PM, or the "team" of PMs. Are there individual registration requirements for the PMs (Page 92, PM Experience)?
ANSWER: Use of single or multiple project managers is strictly up to the individual offeror. Each individual project manager must meet the qualification criteria. There is no registration requirement for project managers.
.
39. In the specific instruction for preparing offers (Clause L.201.01.100.2(g)), the anticipated subcontracting table includes a trade entitled "UST Testing". However, this trade is not specifically identified in any of the CLIN line items. Accordingly, is it actually required? If so, please define "UST Testing" as intended by DESC, and identify how/where relevant pricing should be included.
ANSWER: UST Testing entails precision leak testing of underground storage tanks in accordance with either Federal EPA or local regulatory agency standards. If required this work would be negotiated using Contract Line Items 0016 and /or 0017.

40. The Solicitation is not clear how Project Management and Contract Administration time/level of effort will be accounted for under individual Task Orders. Please clarify.
ANSWER: Management/Administration efforts are negotiated on a case buy case basis dependent on the complexity of the individual Task Order.

41. How will DESC take into account a project-specific activity that clearly does not fall within the scope of work (e.g., very complex investigation requiring larger level of effort for Work Plan, etc.)?
ANSWER: Based on negotiations for actual task orders, multiple units of a Contract Line Item can be authorized, e.g. to prepare a complex Work Plan three (3) work plan units might be authorized.

42. Section H, Paragraph H9 of the Offeror Submission Package a listing of Key Personnel. Can you confirm which labor classifications DESC considers to be key personnel? Or is this at the discretion of the proposer?
ANSWER: As a minimum, Key Personnel include the Project Manager(s) submitted for evaluation in the proposal.

43. Section G of the response contains several grades within labor categories (e.g. Engineer I, II and III). Can you confirm what qualifications and experience are required for these levels as well as those of other similar labor categories (e.g. Geologist, Hydrogeolgist, etc).
ANSWER: These grade categories are provided for the benefit of the offeror. Grade I is the lowest qualified/experienced and Grade III is the highest. If an offeror's personnel system does not use different pay grades for technical personne based on qualification/experience, the same unit cost should be offered for each grade.

6. Following are responses to questions received after May 3, 2002:
SOLICITATION No. SPO600-02-R-0058
RESPONSES TO QUESTIONS RECEIVED AFTER MAY 3, 2002
(NOTE: Questions 1 thru 43 were received prior to May 3 and responded to previously.)

44. What is the duration (day, week, month, year) for CLIN 0016AK - 500CFM ThermOX?
ANSWER: The proposed cost should be for a one (1) month period of time. (Change reflected as part of Amendment No. 0003)

45. What are the bonding requirements?
ANSWER: There is no bonding requirement. Offerors should provide proof of insurance with their proposals.

46. What are the guidelines for set asides, percent of subcontracted work or percent of total?
ANSWER: There are no set-asides for this procurement. A small business subcontracting plan is required in offers from all large businesses. See Clause I171.

47. What is the current level of effort (man-hours/month) to operate and maintain and monitor each system?
ANSWER: Offerors need to determine the level of effort required based on the description of O&M requirements provided as part of the solicitation package. (included with Amendment No. 0003)

48. Can the number of samples for monitoring and system performance evaluation be included in the addenda?
ANSWER: Proposals for this work should be based on the information provided in the description of O&M requirements provided as part of the solicitation package (included with Amendment No.0003)

49. Does O&M include sample analysis costs or are all analytical costs elsewhere?
ANSWER: Sampling and laboratory analysis associated with routine system O&M (as spelled out in the O&M requirements provided as part of the solicitation package) should be included in CLIN 0013A or 0013B as appropriate. Sampling and laboratory analysis associated with the self-monitoring programs (as spelled out in the O&M requirements provided as part of the solicitation package) should be included in CLIN 0014A or 0014B as appropriate.

50. L201.01.100(2)(h) calls for submitting the pricing forms in B35. So does L201.01.100(1). Does DESC want B35 pricing in two locations in the submittal?
ANSWER: An EXCEL spreadsheet file for Clause B35 Prices is provided as part of Amendment No. 0003. Offerors are requested to complete the pricing information, copy the completed file onto a CD-R, and include the CD-R as part of their proposal package. A paper copy of the proposed prices is still required to be submitted in the Business volume of the proposal. In the event of a conflict in information on the CD-R and the paper copy, the paper copy will govern (clarified by Amendment No. 0003).

51. L201.01.100(4) calls for a socioeconomic plan to be submitted with the bid, and I171.01-2(c) calls for a small business subcontracting plan to be submitted with the bid. Does DESC want both documents submitted with the bid? If so, where should the small business subcontracting plan be included?
ANSWER: Both the socioeconomic and small business subcontracting plans should be submitted as part of the bid (proposal) package.

52. What is DESC's SBE/WBE/MBE subcontracting goal? Are the percentages defined in terms of "% of subcontracted work" or "% of total contract amount"?
ANSWER: See Question No. 46 above.

53. At the preproposal meeting, DESC stated that two volumes, technical and business, were to be submitted. We are trying to match this to the requirements in L201.01.100 for submittal of 5 parts (i.e. Certification Package, Technical proposal, Past Performance, Socioeconomic Plan, and Contractor Accounting System). Are we correct in assuming that the business volume includes the Certification Package, and the business volume includes the other 4 parts?
ANSWER: The "business" volume should contain all proposed prices and the certifications. All other information should be submitted as part of the Technical volume.

54. With respect to the requirements in G50.01, CDM understands that the Purchasing System SOP is to be submitted by the successful offeror with the first task order.
ANSWER: The purchasing system standard operating procedure is only required from the successful Offeror after a contract is awarded.

55. Does DESC plan on providing electronic copies of the reps and certs forms and bid forms for offerors to use in preparation of proposals? When and how will these be made available?
ANSWER: An EXCEL spreadsheet file for Clause B35 Prices is provided as part of Amendment No.0003. Offerors are requested to complete the pricing information, copy the completed file onto a CD-R, and include the CD-R as part of their proposal package. A paper copy of the proposed prices is still required to be submitted in the Business volume of the proposal. In the event of a conflict in information on the CD-R and the paper copy, the paper copy will govern. (clarified in Amendment No.0003) We will not be providing electronic copies of the representation and certification clauses.

56. L201.01.100(2)(f) calls for a detailed breakdown of the level of effort required to review existing environmental reports for each site. Please clarify which CLIN this cost should be included in.
ANSWER: The level of effort for document review should be included as part of the Technical volume. The level of effort is a listing of CLINs the Offeror would propose to use to accomplish this review, e.g. CLIN 0016A Project Manager: 8 hours; CLIN 0016I Geologist I: 24 hours; CLIN 0017: description of any other items such as transportation or per diem, copying, etc. Actual dollar amounts should <u>NOT</u> be included in the level of effort.

57. When will DESC circulate copies of the attendee lists for each site pre-proposal meeting?
ANSWER: The list of attendees that participated in the site pre-proposal meetings is included as part of Amendment No. 0003

58. Are there limits on the amount of information included in the proposal?
ANSWER: Unless specifically limited by instructions provided in the solicitation, e.g. Clause L.201.01.100 paragraph 2.b. (1) limits the response to a 1/2 type written page, there is no limit on the size of the proposal. However, Offerors are advised to provide required information as concisely and succinctly as possible and to avoid providing extraneous or other information that was not requested.

7. Following is the list of attendees at the pre-proposal site visits:

LIST OF CONFERENCE ATTENDEES
May 6, 2002 at San Pedro, CA
9:00 A. M.

COMPANY	REPRESENTATIVE	TELEPHONE	FAX
Montgomery Watson	Chris Goodrich	916-997-2250	916-924-3293
	Rich Moren	916-569-3258	916-569-3258
KOMEX	James Farrow	310-914-5901	310-914-5959
	Clive Steggals		
	Paul Rosenfeld		
SHAW	Ed Turner	253-891-0564	253-891-8606
	Jay Neuhaus	949-660-7571	949-474-8309
	Matt Curtis	949-660-5359	949-474-8309
	Daoud Alsawaf	949-660-5480	949-474-8309
	Chuck Campbell	949-660-7599	949-474-8309
	John Accardi	805-388-3035	805-987-1165
CDM	Scott Supernaugh	562-432-7996	562-495-8095
Parsons	Redwan Hassan	949-263-9322	949-263-1225
The Source Group	Neil Irish	805-373-9063	805-373-9073
	Fred Clark		
Foster Wheeler	Larry Kahrs	617-457-8243	617-457-8498
	Abram Eloskof		
Arcadis G&M	Barry Molnna	714--278-0992	714-278-0051
Roy F. Weston, Inc	David Anderson	707-290-7238	
	Jeff Lance	619-994-8865	
EQM	Sharon Kemner	513-825-7500	513-825-7495
	Bill Kemner		
TETRA TECH, Inc.	Douglas S. Grant	619-321-6737	619-525-7186
Weston	Jeff Bannon	818-382-1808	818-382-1801
Millers Brooks	Tracy Naughton	714-965-9161	714-965-9161
	Dan Ramsay		
	Todd Overturf		
Harding ESE	John Cromwell	213-922-2428	
Defense Energy Support Center	Laura McCants	703-767-9335	703-767-9338
	Jack O'Donovan	703-767-8309	703-767-8331
	Hasan Dogrul	703-767-8308	703-767-8331

LIST OF CONFERENCE ATTENDEES
May 6, 2002 at Norwalk, CA
1:00 P.M.

COMPANY	REPRESENTATIVE	TELEPHONE	FAX
Montgomery Watson	Chris Goodrich	916-997-2250	916-231-4433
	Rich Moren	916-569-3245	
KOMEX	James Farrow	310-914-5901	310-914-5959
	Clive Steggals		
	Paul Rosenfeld		
DAI Environmental	Kurt Thomsen	847-573-8900	847-573-8953
Foster Wheeler	Abram Eloskof	949-756-7521	
Millers Brooks	Tracy Naughton	714-965-9161	714-965-9161
EQM	Sharon Kemner	702-257-6111	702-889-1100
	Bill Kemner		
Harding ESE	John Cromwell	949-224-0050	
The Shaw Group	Scott Speipel	949-660-5495	949-474-1692
	Bruce Babbit	949-660-7595	
The Source Group	Neil Irish	562-597-1055	805-373-9073
	Fred Clark	805-373-9063	
Arcadis G&M	Barry Molnna	714--278-0992	714-278-0051
Roy Weston	Jeff Bannon	818-382-1808	818-382-1801
TETRA TECH, Inc.	Douglas Grant	619-321-6737	619-525-7186
Roy Weston	Jeff Bannon	818-382-1808	818-382-1801
	David Anderson	707-290-7238	
	Jeff Lance	619-994-8865	
Parsons	Redwan Hassan	949-263-9322	949-263-1225
SHAW	Ed Turner	253-891-0564	253-891-8606
	John Accardi	805-388-3035	805-987-1165
	Chuck Campbell	949-660-7599	949-474-8309
	Daoud Alsawaf	949-660-5480	949-474-8309
Defense Energy Support Center	Laura McCants	703-767-9335	703-767-9338
	Jack O'Donovan	703-767-8309	703-767-8331
	Hasan Dogrul	703-767-8308	703-767-8331

LIST OF CONFERENCE ATTENDEES
May 7, 2002 at San Diego (Pt. Loma), CA
9:00 A. M.

COMPANY	REPRESENTATIVE	TELEPHONE	FAX
Montgomery Watson	Chris Goodrich	916-997-2250	916-231-4433
	Rich Moren	916-569-3245	916-569-3258
KOMEX	Paul Rosenfeld	714-981-3282	310-914-5959
EQM	Sharon Kemner	513-825-7500	513-825-7495
	Bill Kemner		
CDM	Matt Brookshire	858-268-3383	858-268-9677.
SHAW	Ed Turner	253-891-0564	253-891-8606
TETRA TECH, Inc.	Mike Teate	619-525-7188	619-525-7186
Roy F.Weston	Sean Delaney	619-987-0888	760-634-7718
Foster Wheeler	Kent Weingardt	619-471-3532	619-234-8591
DAI	Kurt Thomsen	847-573-8900	847-573-8953
Parsons	Mike Wolff	949-263-9322	949-263-1225
Parsons	Redwan Hassan	949-263-9322	949-263-1225
SHAW	Peter Merz	619-533-7304	619-239-1238
	John Accardi	805-388-3035	805-987-1165
Weston	David Anderson	916-372-1534	
Miller Brooks	Dan Ramsey	714-965-9161	714-965-9163
The Source Group	Fred Clark	805-373-9063	805-373-9073
Roy Weston	Jeff Bannon	818-382-1808	818-382-1801
The Source Group	Neil Irish	562-597-1055	562-597-1070
FISC Pt. Loma	Steve Frey	619-553-1314	619-553-4877
	Paul Amodio	619-553-1312	619-553-4877
Defense Energy Support Center	Laura McCants	703-767-9335	703-767-9338
	Jack O'Donovan	703-767-8309	703-767-8331
	Hasan Dogrul	703-767-8308	703-767-8331

LIST OF CONFERENCE ATTENDEES
May 6, 2002 at Ozol, CA
10:00 A. M.

COMPANY	REPRESENTATIVE	TELEPHONE	FAX
Roy F. Weston, Inc	David Anderson	707-290-7238	916-372-0367
SHAW	Ed Turner	253-891-0564	253-891-8606
	John Ranspach	925-288-2303	925-827-2029
MWH	Gary Enloe	916-921-3552	916-924-3293
Roy Weston	Cris Jespersen	707-562-3268	707-562-3266
	Emma Popek	707-551-7018	
Montgomery Watson	Chris Goodrich	916-997-2250	916-231-4433
Komex	Dan Foster	916-797-7283	916-797-1101
	Paul Rosenfeld	310-914-5901	310-914-5959
Parsons	Tim Anenson	916-480-7472	916-483-3364
Miller Brooks Env.	Dean Gregg	714-965-9161	714-965-9163
DAI Environmental	Kurt Thomsen	847-573-8900	847-573-8953
Foster Wheeler	Larry Kahrs	617-457-8243	617-457-8498
	Gerry Slattery	415-671-1990	415-671-1995
Harding ESE	Michael Jacobvitz	415-884-3161	415-884-3300
Arcadis	Mark Dockum	510-233-3200	510-233-3204
SHAW	John Accardi	805-388-3035	805-987-1165
Tetra Tech, Inc.	Kevin Bricknell	415-222-8306	415-543-5480
The Source Group	Neil Irish	562-597-1055	562-597-1070
	Kent Reynolds	925-944-2856	925-944-2859
Defense Energy Support Center	Laura McCants	703-767-9335	703-767-9338
	Jack O'Donovan	703-767-8309	703-767-8331
	Hasan Dogrul	703-767-8308	703-767-8331

8. Attached is the synopsis of the Operations and Maintenance Plan for DFSP Ozol to be used in proposing costs for CLINs 0013A and 0014A.

OPERATION AND MAINTENANCE PLAN

DEFENSE FUEL SUPPORT POINT - OZOL
700 CARQUINEZ SCENIC DRIVE
MARTINEZ, CALIFORNIA

CONTRACT NUMBER: SP0600-98-C-5838
TASK ORDER ACO-0024

FEBRUARY 2002

VOLUME I

Prepared for
DEPARTMENT OF DEFENSE
DEFENSE ENERGY SUPPORT CENTER
FT. BELVOIR, VIRGINIA

Prepared by
IT Corporation
(A Member of the IT Group)

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APPENDICES

1.0 INTRODUCTION

This Operation and Maintenance (O&M) Plan has been prepared to explain the recurring O&M tasks of the Defense Fuel Supply Point (DFSP)-Ozol caretaker contractor. Five major areas are discussed:

- Monitoring and sampling of groundwater using monitoring wells are discussed in Section 2.0, Environmental Self-Monitoring Plan.
- O&M of the groundwater remediation systems are discussed in Section 3.0, Environmental Remediation Systems.
- Maintenance of the existing pipelines, including the pipeline to the Concord Pump Station, the backup diesel generator, roads, fire protection system and weed abatement are discussed in Section 4.0, Grounds Maintenance.
- The site's security features, including pier lighting, are discussed in Section 5.0, Security.
- DFSP-Ozol's participation in the Underground Service Alert (USA) system is discussed in Section 6.0, Underground Service Alert.

Environmental cleanup of groundwater is currently in progress at the DFSP Ozol facility. The current strategy for cleanup is to contain dissolved and separate-phase contaminants (primarily aviation fuels) from migrating to areas of lower hydraulic gradient and to the Carquinez Strait.

The facility is located at 700 Carquinez Scenic Drive, south of Martinez, California (Figure 1, Appendix A-1). There are 64 groundwater monitoring wells and three groundwater extraction wells in place (Figure 2, Appendix A-1). The facility is comprised of two separate operational areas; the fuel storage tank farm, and the administrative and fuel distribution area. The tank farm lies on top of the hilly area on the west side of the facility and the administrative and fuel distribution area lies at the bottom of the drainage valley adjacent to Carquinez Strait.

2.0 ENVIRONMENTAL SELF-MONITORING PLAN

The following subsections describe the activities associated with groundwater well network that is in place at the Ozol facility.

2.1 GROUNDWATER GAUGING AND SAMPLING PROGRAM

The Self-Monitoring Program (SMP) was developed to satisfy Regional Water Quality Control Board (RWQCB) Order No. 93-131, Section d.1 (Appendix A-2), and to provide the RWQCB with the following information:

- The frequency of gauging and sampling events;

- The identification of groundwater monitoring wells that will be gauged and sampled as part of the self-monitoring program;
- The chemical parameters for which the groundwater samples will be analyzed;
- Hydrogeologic data, including groundwater elevation measurements and petroleum product thickness measurements;
- Presentation of a Quality Assurance Project Plan (QAPP) which details the quality assurance/quality control (QA/QC) procedures to be followed while conducting activities outlined in this work plan. The QAPP was submitted to the RWQCB under separate cover, and is presented in Appendix A-2.

The SMP and RWQCB Order No. 93-131 are presented in Appendix A-2. A letter dated June 5, 2000 from the RWQCB amends the sampling schedule in the SMP, and is also presented in Appendix A-2.

2.1.1 Monitoring Well Network

A total of 67 on-site wells are gauged for liquid levels on a semiannual basis. A total of 65 wells are sampled during each October semiannual sampling event, and 56 of the wells are sampled during each March semiannual sampling event. Table 1 (Appendix A-1) presents the specific sampling schedule for each of the 67 wells. Two monitoring wells (M17 and M19) are gauged but not sampled because more representative analytical data can be obtained from a nearby well (wells DM48 and EA28, respectively).

A well construction summary is presented on Table 2 (Appendix A-1).

2.1.2 Groundwater Level Measurements

Groundwater levels are measured on a semiannual basis in the selected monitoring wells (Table 2, Appendix A-1). The wells are gauged to measure the depth-to-water (DTW) and depth-to-Product (DTP) using an INTERFACE PROBE™ Well Monitoring System (IP), which can detect both water and SPH levels to the nearest 0.01 foot. The terms “product” and “separate-phase hydrocarbons (SPH)” are used interchangeably in this document. The DTW and DTP are measured from a surveyed mark on the well casings. Groundwater level measurements are conducted in accordance with the QA/QC procedures set forth in Section 3.1 of the QAPP.

Data from the wells that are gauged semiannually provide representative groundwater elevation data that allows calculation of gradient as required by the RWQCB Self-Monitoring Program. The data also provides information regarding the presence or absence of SPH.

2.1.3 SPH Thickness Measurements and Removal from Monitoring Wells

If SPH is observed floating on the groundwater surface during well gauging, the thickness of the SPH is measured to the nearest 0.01 foot. SPH thickness is measured using an IP in accordance with the QA/QC procedures set forth in Section 3.1.2 of the QAPP.

Passive product skimmers are used at the site in monitoring wells that contain SPH. The skimmers are moved between wells as necessary depending on where product is detected. At the date of this report, a total of 14 skimmers are located at the site and all 14 are deployed in wells 02A, 04, 06B, DM41, DM44, DM45, DM46, EA33, G56, G68, M11, M15, M21, and M22. The skimmers not deployed are stored for future use as needed. Wells that have historically contained SPH are gauged monthly and fitted with skimmers if SPH are detected. As a general policy, skimmers are maintained in wells with the greatest SPH thickness.

Product is measured and recovered from the skimmers on a monthly basis. The volume of SPH removed from each skimmer is measured, then placed in the product holding tank located at the Tank Farm Groundwater Remediation System (see Section 3.3 for a more detailed description of the process). Product recovered from the wells with skimmers during the first six monthly visits in 2001 is shown on Table 3 (Appendix A-1). The volume of SPH was recovered during this reporting period (less than one gallon) was similar to the volume recovered during January to June 2000. The volume of SPH recovered between July and December 2000 was approximately 0.5 gallons.

2.1.4 Groundwater Sampling

Groundwater monitoring and extraction wells are sampled to assess the groundwater quality at the DFSP-Ozol facility. Groundwater is sampled according to the QA/QC procedures set forth in the QAPP. The semiannual groundwater sampling events coincide with the semiannual monitoring events. Purge water generated during the groundwater sampling is treated on-site at the groundwater treatment plant and discharged under the NPDES permit. The purge water is pumped into the feed surge tank (see Section 3.0 below) and is then processed along with the groundwater extracted from the two extraction systems.

Groundwater samples are not collected from wells that exhibit the presence SPH with a thickness of greater than 0.02 foot. During the past two years, the following wells have contained measurable SPH: 6B, DM44, DM45, EA33, G68, M15, M21, and M22.

2.1.5 Laboratory Analysis of Groundwater Samples

Groundwater samples collected at the DFSP-Ozol facility are transported, under chain-of-custody protocol, to a California-certified laboratory for analysis. The chain-of-custody documentation is maintained in designated files at the home office.

Groundwater samples are analyzed in the laboratory for total petroleum hydrocarbons (TPH)-as-Aviation Gas using EPA Method M8015V, for TPH-as-Jet Fuel (JP5/8) using EPA Method M8015E, for benzene, toluene, ethylbenzene, and xylenes (BTEX) using EPA Method 8021, and for total lead using EPA Method 6010. Table 4 of the QAPP indicates the quality control (QC) samples required for sample collection and analysis frequency. Analytical procedures are to adhere to protocol set forth in the QAPP.

2.2 PROJECT REPORTING

In accordance with Provision 1.d.2. of RWQCB Order 93-131, a report documenting the quarterly (now semiannual) gauging and sampling activities shall be submitted by the 15th of each month following the end of the previous quarter (now semester). The semiannual reports should provide, at a minimum, the following data:

- Copies of the signed Chain-of-Custody records;
- Laboratory QA/QC reports;
- Water level, and well purging (pH, conductivity, temperature) data [Note: Order 93-131 requires that analytical reports be included in the SMP reports, however the current RWQCB policy specifically requests that the laboratory reports NOT be included in the SMP reports];
- Sample detection limits;
- Contaminant isoconcentration and potentiometric surface maps; and
- Purge water treatment or disposal information.

3.0 ENVIRONMENTAL REMEDIATION SYSTEMS

There are three groundwater remediation systems in place at DFSP-Ozol:

- The Tank Farm Groundwater Remediation System (TFGRS) collects groundwater from recovery well RW-1, the Generator Building SPH Recovery System (GBSRS), two hydrauger collection sumps, and purge water from groundwater monitoring and sampling activities. The collected groundwater is treated and discharged under a National Pollution Discharge Elimination System (NPDES) permit issued by the San Francisco Regional Water Quality Control Board (RWQCB). In some earlier text, this system has been called the Pilot Interceptor Trench and Seep/Hydrauger Collection System.
- The GBSRS pumps groundwater and separate-phase hydrocarbons (SPH) from well G-57, near the Generator Building. The groundwater and SPH are separated in an oil/water separator (OWS) and the groundwater is pumped to the TFGRS for treatment and discharge. The SPH is stored in a holding tank for disposal.

- Passive SPH skimmers are installed in several monitoring wells (See Section 2.1.3 above.). These skimmers are manually emptied monthly, and the volume and characteristics of the collected SPH are recorded.

3.1 TANK FARM GROUNDWATER REMEDIATION SYSTEM

3.1.1 Introduction

The TFGRS was formerly known as the "Pilot Interceptor Trench Remediation System" and the "Interceptor Trench and Seep/Hydrauger Collection System". The system was originally designed to evaluate the use of a bentonite cut-off wall to intercept and recover separate-phase and dissolved-phase hydrocarbons flowing beneath the valley floor from the tank farm to the truck loading area. A cut-off wall was intended to funnel the separate-phase and dissolved-phase hydrocarbons into recovery well RW-2, from which the hydrocarbons would be recovered for treatment. Because the fuel piping is deeper than expected and below the groundwater surface, it was deemed too risky to install the cut-off wall. No SPH has entered well RW-2, however SPH continues to enter well RW-1, located upgradient from well RW-2, near the TFGRS. The pumps have been removed from well RW-2 and a pneumatic, total-fluids pump has been installed in well RW-1. Groundwater and SPH are pumped from well RW-1 to the TFGRS OWS. The separated SPH is drained to Product Storage Tank T-200 and the groundwater to Feed Surge Tank T-105 for treatment and discharge to an ephemeral stream leading to Carquinez Strait. The groundwater is treated by filtration, air stripping, further filtration and carbon adsorption.

Based on field observations, hydrocarbons are being discharged from several hydraugers and surface seeps in the upper portion of the facility. Since the hydraugers were installed to drain water from the hill to prevent movement of soils, the seep and hydrauger water is collected and treated to remove hydrocarbons by the TFGRS prior to discharge to the ephemeral stream.

The basis of the system design is discussed in Appendix B-1, *Pilot Interceptor Trench and Seep/Hydrauger Collection Remediation System Report*.

TFGRS system drawings are located in Appendix B-2. Manufacturer's literature for the equipment installed in the TFGRS is located in Appendix B-3.

3.1.2 Operating Procedures

3.1.2.1 Initial Conditions

These conditions assume the system is shut down and in a standby condition, such as following maintenance.

3.1.2.1.1 Valve Positions

1. Groundwater Extraction Pump Isolation Valve, HV-100, is CLOSED.
2. Groundwater Sample Valve, AP-100, is CLOSED.
3. Groundwater Extraction Pump Throttle Valve, HV-101, is CLOSED.
4. Product Skimming Pump Isolation Valve, HV-200, is CLOSED.
5. Product Sample Valve, AP-200, is CLOSED.
6. Product Skimming Pump Throttle Valve, HV-201, is CLOSED.
7. Compressed air supply to well RW-1 is CLOSED.
8. Sump Pump Isolation Valve, HV-121, is OPEN.
9. Feed Surge Tank Inlet Valve, HV-102, is OPEN.
10. Feed Surge Tank Inlet Sample Valve, AP-101, is CLOSED.
11. Oil/Water Separator Water Outlet Valve, HV-301, is OPEN.
12. Oil/Water Separator Outlet Sample Valve, AP-300, is CLOSED.
13. Oil/Water Separator Product Outlet Valve, HV-300, is OPEN.
14. Product Storage Tank Inlet Valve, HV-202, is OPEN.
15. Feed Surge Tank Outlet Valve, HV-103, is OPEN.
16. Air Stripper Feed Pump Outlet Valve, HV-104, is OPEN.
17. Air Stripper Feed Filter A Inlet Valve, HV-105, is OPEN.
18. Filter Inlet Sample Valve, AP-107, is CLOSED.
19. Air Stripper Feed Filter B Inlet Valve, HV-107, is OPEN.
20. Air Stripper Feed Filter A Drain Valve, HV-123, is CLOSED.
21. Air Stripper Feed Filter B Drain Valve, HV-122, is CLOSED.
22. Air Stripper Feed Filter A Outlet Valve, HV-106, is OPEN.
23. Air Stripper Feed Filter B Outlet Valve, HV-108, is OPEN.
24. Air Stripper Feed Filter dP High Isolation Valve, HV-109, is OPEN.
25. Air Stripper Feed Filter dP Low Isolation Valve, HV-110, is OPEN.
26. Filter Outlet Sample Valve, AP-102, is CLOSED.
27. Air Stripper Outlet Valve, HV-111, is OPEN.
28. Air Stripper Effluent Pump Discharge Valve, HV-118, is OPEN.
29. Air Stripper Effluent Sample Valve, AP-103, is CLOSED.
30. Liquid granular activated carbon (GAC) Midpoint Sample Valve, AP-109, is CLOSED.
31. GAC Fill Valve, HV-120, is CLOSED.
32. Effluent Discharge Valve, HV-119, is CLOSED.
33. Liquid Effluent Sample Valve, AP-108, is CLOSED.
34. Vapor-Phase GAC Bed T-101 Sample Valve, AP-104, is CLOSED.
35. Vapor-Phase GAC Bed T-101 Inlet Valve, HV-112, is OPEN.
36. Vapor-Phase GAC Bed T-102 From T-101 Inlet Valve, HV-114, is OPEN.
37. Vapor-Phase GAC Bed T-102 Effluent Valve, HV-117, is OPEN.
38. Vapor-Phase GAC Bed T-102 Sample Valve, AP-105, is CLOSED.
39. Vapor-Phase GAC Bed T-102 Inlet Valve, HV-113, is CLOSED.
40. Vapor-Phase GAC Bed T-101 From T-102 Inlet Valve, HV-116, is CLOSED.
41. Vapor-Phase GAC Bed T-101 Effluent Valve, HV-115, is CLOSED.
42. Vapor Effluent Sample Valve, AP-106, is CLOSED.
43. Sump V-1 Sample Valve, AP-4, is CLOSED.

44. Sump V-4 Sample Valve, AP-5, is CLOSED.
45. Sump V-1 Sample Valve, AP-1, at Sump V-1, is CLOSED.
46. Filter F-1 Inlet Valve, HV-4, is OPEN.
47. Filter F-1 Bypass Valve, HV-8 is CLOSED.
48. Filter F-1 Outlet Valve, HV-5, is OPEN.
49. Sump V-1 Throttle Valve, HV-1, is OPEN.
50. Sump V-1 Hose Drain, HV-11, is CLOSED.
51. Sump V-2 Outlet Valve, HV-2, is CLOSED.
52. Sump V-3 Outlet Valve, HV-10, is CLOSED.
53. Sump V-4 Sample Valve, AP-3, at Sump V-4, is CLOSED.
54. Filter F-2 Inlet Valve, HV-6, is OPEN.
55. Filter F-2 Bypass Valve, HV-9, is CLOSED.
56. Filter F-2 Outlet Valve, HV-7, is OPEN.
57. Sump V-4 Throttle Valve, HV-3, is OPEN.
58. Sump V-4 Hose Drain, HV-12, is CLOSED.

3.1.2.1.2 Electrical Lineup

1. 480 V Underground Lighting Feeder is ENERGIZED.
2. At Sump V-1, VERIFY Hand-Off-Auto Switch is in OFF.
3. At Sump V-4, VERIFY Hand-Off-Auto Switch is in OFF.
4. VERIFY Circuit Breaker for V-1 is ON.
5. VERIFY Circuit Breaker for V-4 is ON.
6. At Main Control Panel, VERIFY System ON-OFF Switch is OFF.
7. At Power Panel PP-1, VERIFY LP-3 Breaker is ON.
8. VERIFY Blower B-100 Breaker is ON.
9. VERIFY Air Stripper Effluent Pump P-101 Breaker is ON.
10. VERIFY Air Stripper Feed Pump P-102 Breaker is ON.
11. At Lighting Panel LP-3, VERIFY Sump Pump, P-104 Breaker is ON.
12. At Lighting Panel LP-3, VERIFY Main Control Panel Breaker is ON
13. VERIFY pH Element, AE-100, and Controller, AIC-100, are CALIBRATED.

3.1.2.2 Start Tank Farm Groundwater Remediation System

3.1.2.2.1 Start Treatment System

1. OPEN Effluent Discharge Valve, HV-119.
2. At the Main Control Panel, PRESS the System START Button.
3. VERIFY Solenoid Valve SV-1, water from V-4, opens.
4. VERIFY Solenoid Valve SV-2, air to RW-1, opens.
5. VERIFY Solenoid Valve SV-3, water from V-1, opens.

3.1.2.2.2 Start Recovery Well RW-1

1. Using an interface probe (IP), MEASURE the thickness of separate-phase hydrocarbons (SPH) in Recovery Well RW-1.

2. VERIFY Air Compressor at Generator Building is in operation.
3. OPEN the air supply valve to RW-1.
4. VERIFY P-100 starts.
5. RECORD the following system parameters while P-100 is running:
   - P-100 Discharge Pressure, PI-100
   - P-100 Flow Rate, FIQ-100 (RECORD difference in readings one minute apart).
   - P-100 total flow
   - P-100 depth
   - P-100 cycle counter reading
   - P-100 cycle frequency
6. ADJUST the depth of P-100 so that both water and SPH are pumped.

3.1.2.2.3 Start Seep/Hydrauger Lift Station V-1

1. Station one operator at Lift Station V-1. Station a second operator at Oil/Water Separator V-5.
2. At the V-1 Pump Control Panel, VERIFY the Lift Station Pump P-1 Circuit Breaker is ON.
3. TURN the P-1 Hand-Off-Auto Switch to AUTO.
4. VERIFY P-1 starts.
5. When water begins to enter the Oil/Water Separator, V-5, RECORD the following system parameters while P-1 is running:
   - P-1 Discharge Pressure, PI-1
   - Filter F-1 Differential Pressure, PDI-1
   - P-1 Flow Rate, FIQ-1 (RECORD difference in readings one minute apart.

3.1.2.2.4 Start Seep/Hydrauger Lift Station V-4

1. Station one operator at Lift Station V-4. Station a second operator at Oil/Water Separator V-5.
2. At the V-4 Pump Control Panel, VERIFY the Lift Station Pump P-2 Circuit Breaker is ON.
3. TURN the P-2 Hand-Off-Auto Switch to AUTO.
4. VERIFY P-2 starts.
5. When water begins to enter the Oil/Water Separator, V-5, RECORD the following system parameters while P-2 is running:
   - P-2 Discharge Pressure, PI-2
   - Filter F-2 Differential Pressure, PDI-2
   - P-2 Flow Rate, FIQ-2 (RECORD difference in readings one minute apart.

3.1.2.2.5 Start Seep/Hydrauger Sump V-3

1. OPEN Sump V-3 Outlet Valve, HV-10.
2. VERIFY oil/water flows from sump V-3 to Lift Station V-4.

3.1.2.2.6 Start Seep/Hydrauger Sump V-2

1. OPEN Sump V-2 Outlet Valve, HV-2.
2. VERIFY oil/water flows from sump V-2 to the Oil/Water Separator, V-5.

3.1.2.2.7 Check System Instrumentation

3. RECORD the following information while P-101, P-102, and B-100 are running (Use Site Visit Form in Appendix B-4.):
   - Air Stripper Feed Pump Discharge Pressure, PI-101
   - Air Stripper Feed Filter Differential Pressure, PDI-100
   - Air Stripper Effluent Vapor Pressure, PI-103
   - Air Stripper Effluent Vapor Temperature, TI-102
   - Air Stripper Vapor Flow Rate, FIQ-400
   - Primary GAC Discharge Pressure, PI-104
   - GAC Effluent Flow Rate, FIQ-500
   - Air Stripper Effluent pH, AIC-100
4. If AIC-100 reads greater than 7.5 pH, VERIFY P-103 is operating.

3.1.2.3 Collect Samples

3.1.2.3.1 Monthly Sampling for National Pollutant Discharge Elimination System (NPDES) Permit:

1. COLLECT a sample from Air Stripper Effluent Sample Valve, AP-103.
2. Using calibrated portable instruments, MEASURE the following parameters:
   - Temperature
   - Conductivity
   - pH
   - Dissolved Oxygen
3. COLLECT Laboratory Samples from AP-103 for the following:
   - TPH-as-gasoline using EPA Method M8015V, 3 VOAs, preserved with hydrochloric acid
   - TPH-as-jet fuel and as-diesel using EPA M8015E, 2 amber liter glass bottles, without preservative
4. COLLECT a sample from Effluent Sample Valve, AP-108.
5. Using calibrated portable instruments, MEASURE the following parameters:
   - Temperature
   - Conductivity
   - pH
   - Dissolved Oxygen
   - Turbidity
6. COLLECT Laboratory Samples from AP-108 for the following:
   - Volatile Organic Compounds (VOCs) using EPA Methods 5030B/8260B, 3 VOAs, preserved with hydrochloric acid

- TPH-as-gasoline using EPA Method M8015V, 3 VOAs, preserved with hydrochloric acid
- TPH-as-jet fuel and as-diesel using EPA M8015E, 2 amber liter glass bottles, without preservative

7. COLLECT Laboratory Samples from Liquid GAC Midpoint Sample Valve, AP-109, for the following:
   - TPH-as-gasoline using EPA Method M8015V, 3 VOAs, preserved with hydrochloric acid
   - TPH-as-jet fuel and as-diesel using EPA M8015E, 2 amber liter glass bottles, without preservative
8. At the receiving stream just before it enters the culvert under Carquinez Scenic Drive, RECORD the following on Observations Form in Appendix B-4:
   - Floating and suspended materials of waste origin (to include oil, grease, algae, and other macroscopic particulate matter): its presence or absence, its source, and size of the affected area.
   - Discoloration and turbidity of the water: description of color, source, and size of affected area.
   - Odor: presence or absence, characterization, source, distance of travel, and wind direction.
   - Evidence of beneficial water use by wildlife
   - Weather conditions: temperature, wind - direction and velocity, precipitation.
   - FORWARD all samples to the California Department of Health Services (DOHS)-certified laboratory under chain-of-custody.

3.1.2.3.2 Additional Annual Sampling:

1. These additional samples shall be collected on the same day as monthly samples from Effluent Sample Valve, AP-108, in Section 3.1.2.3.1.
2. COLLECT Laboratory Samples from AP-108 for the following:
   - Dissolved metals using EPA Methods 200.7/200.9, 500 milliliter polyethylene, preserved with nitric acid.
   - Semi-volatile organic compounds (SVOCs) using EPA Method 8270C, 1 liter glass, without preservative
   - Aquatic Toxicity, Rainbow Trout, 5 gallon polyethylene
   - Hardness, 500 milliliter polyethylene, without preservative
3. FORWARD all samples to the DOHS-certified laboratory under chain-of-custody. NOTE on the chain-of-custody that detection limits for the following shall be no higher than:
   - Antimony 10 micrograms per liter (μg/L)
   - Arsenic 5 μg/L
   - Beryllium 10 μg/L
   - Cadmium 5 μg/L
   - Chromium 5 μg/L
   - Copper 5 μg/L
   - Lead 5 μg/L

- Mercury 5 µg/L
- Nickel 5 µg/L
- Selenium 5 µg/L
- Silver 5 µg/L
- Thallium 10 µg/L
- Zinc 10 µg/L
- Cyanide 10 µg/L

3.1.2.3.3 Vapor Samples

PERFORM the following samples daily, when on site:

1. COLLECT a grab sample from Vapor-Phase GAC Bed T-101 Sample Valve, AP-104, in a minimum 1-liter Tedlar bag.
2. RECORD the VOC concentration from the AP-104 Tedlar bag using a calibrated portable flame-ionization detector (FID) on a Site Visit Form, Appendix B-4.
3. COLLECT a grab sample from Vapor-Phase GAC Bed T-102 Sample Valve, AP-105, in a minimum 1-liter Tedlar bag.
4. RECORD the VOC concentration from the AP-105 Tedlar bag using a calibrated portable FID on the Site Visit Form, Appendix B-4.
5. COLLECT a grab sample from Vapor Effluent Sample Valve, AP-106, in a minimum 1-liter Tedlar bag.
6. RECORD the VOC concentration from the AP-106 Tedlar bag using a calibrated portable FID on the Site Visit Form, Appendix B-4.

3.1.2.4 System Shutdown

1. RECORD the following information while P-101, P-102, and B-100 are running on a Site Visit Form, Appendix B-4:
   - Air Stripper Feed Pump Discharge Pressure, PI-101
   - Air Stripper Feed Filter Differential Pressure, PDI-100
   - Air Stripper Effluent Vapor Pressure, PI-103
   - Air Stripper Effluent Vapor Temperature, TI-102
   - Air Stripper Vapor Flow Rate, FIQ-400
   - Primary GAC Discharge Pressure, PI-104
   - GAC Effluent Flow Rate, FIQ-500
   - Air Stripper Effluent pH, AIC-100
2. CLOSE Sump V-2 Outlet Valve, HV-2.
3. CLOSE Sump V-3 Outlet Valve, HV-10.
4. RECORD the following system parameters while P-2 is running:
   - P-2 Discharge Pressure, PI-2
   - Filter F-2 Differential Pressure, PDI-2
   - P-2 Flow Rate, FIQ-2 (RECORD difference in readings one minute apart.)
5. TURN the P-2 Hand-Off-Auto Switch to OFF.
6. RECORD the following system parameters while P-1 is running:
   - P-1 Discharge Pressure, PI-1

- Filter F-1 Differential Pressure, PDI-1
- P-1 Flow Rate, FIQ-1 (RECORD difference in readings one minute apart.)

7. TURN the P-1 Hand-Off-Auto Switch to OFF.
8. RECORD the following system parameters while P-100 is running:
   - P-100 Discharge Pressure, PI-100
   - P-100 Flow Rate, FIQ-100 (RECORD difference in readings one minute apart).
   - P-100 total flow
   - P-100 depth
   - P-100 cycle counter reading
   - P-100 cycle frequency
9. Using an IP, MEASURE the thickness of SPH in Recovery Well RW-1.
10. Close the compressed air supply valve to well RW-1.
11. At the Main Control Panel, PRESS the System STOP Button.
12. VERIFY Solenoid Valve SV-1 closes.
13. VERIFY Solenoid Valve SV-2 closes.
14. VERIFY Solenoid Valve SV-3 closes.
15. CLOSE Effluent Discharge Valve, HV-119.

3.1.2.5 Alarm Condition Responses

3.1.2.5.1 High Air Stripper Feed Filter Differential Pressure, PDAH-100

If Feed Filter F-100A is in operation:

1. OPEN Air Stripper Feed Filter B Inlet Valve, HV-107.
2. OPEN Air Stripper Feed Filter B Outlet Valve, HV-108.
3. VERIFY the Air Stripper Feed Filter Differential Pressure, PDI-100, is less than 20 psid.
4. At the Main Control Panel, PRESS the System STOP Button.
5. VERIFY High Differential Pressure Alarm Light, PDAH-100, goes out.
6. WAIT at least 10 seconds, PRESS the System START Button.
7. CLOSE Air Stripper Feed Filter A Inlet Valve, HV-105.
8. CLOSE Air Stripper Feed Filter A Outlet Valve, HV-106.
9. OPEN Air Stripper Feed Filter A Drain Valve, HV-123, and DRAIN the filter housing to Sump, V-6.
10. WHEN all pressure has been relieved from F-100A, SLOWLY REMOVE Filter F-100A cover.
11. REPLACE the filter elements with seven new elements per the manufacturer's instructions.
12. DISCARD the used filter elements in the solid waste drum for disposal.
13. CLOSE Air Stripper Feed Filter A Drain Valve, HV-123.

If Feed Filter F-100B is in operation:

1. OPEN Air Stripper Feed Filter A Inlet Valve, HV-105.

2. OPEN Air Stripper Feed Filter A Outlet Valve, HV-106.
3. VERIFY the Air Stripper Feed Filter Differential Pressure, PDI-100, is less than 20 psid.
4. At the Main Control Panel, PRESS the System STOP Button.
5. VERIFY High Differential Pressure Alarm Light, PDAH-100, goes out.
6. WAIT at least 10 seconds, PRESS the System START Button.
7. CLOSE Air Stripper Feed Filter B Inlet Valve, HV-107.
8. CLOSE Air Stripper Feed Filter B Outlet Valve, HV-108.
9. OPEN Air Stripper Feed Filter B Drain Valve, HV-122, and DRAIN the filter housing to Sump, V-6.
10. WHEN all pressure has been relieved from F-100B, SLOWLY REMOVE Filter F-100A cover.
11. REPLACE the filter elements with seven new elements per the manufacturer's instructions.
12. DISCARD the used filter elements in the solid waste drum for disposal.
13. CLOSE Air Stripper Feed Filter B Drain Valve, HV-122.

3.1.2.5.2 Replacement of Vapor-Phase GAC if Vapor-Phase GAC Bed T-101 is primary bed:

1. When the concentration of volatile hydrocarbons at Vapor-Phase GAC Bed T-102 Sample Valve, AP-105, is 10 percent of the concentration at Vapor-Phase GAC Bed T-101 Sample Valve, AP-104, [but greater than 10 parts per million by volume (ppmv)] PERFORM the following:
2. SHUT DOWN the System per section 3.1.2.4 of the procedures.
3. Make arrangements with the GAC service vendor to remove, regenerate and replace the GAC in T-101.
4. LOCKOUT/TAGOUT Air Stripper Blower, B-100.
5. CLOSE Vapor-Phase GAC Bed T-101 Inlet Valve, HV-112.
6. CLOSE Vapor-Phase GAC Bed T-102 From T-101 Inlet Valve, HV-114.
7. CLOSE Vapor-Phase GAC Bed T-102 Effluent Valve, HV-117.

WARNING! GAC BED ATMOSPHERES MAY BE OXYGEN DEFICIENT AND HAVE HIGH HYDROCARBON CONCENTRATIONS. DO NOT ENTER THE BED. MONITOR HYDROCARBON VAPOR CONCENTRATIONS IN THE BREATHING ZONE USING A FID OR PID WHILE THE BED IS OPEN. THE PEL FOR HYDROCARBON VAPORS IS 300 PARTS PER MILLION (PPM).

IF THE HYDROCARBON VAPOR CONCENTRATION AT ANY LOCATION EXCEEDS THE SCALE ON THE FID OR PID, MONITOR CONCENTRATIONS USING A FLAMMABLE GAS METER. DO NOT ALLOW THE HYDROCARBON CONCENTRATION TO EXCEED 20 PERCENT OF LOWER EXPLOSIVE LIMIT (LEL) AT ANY LOCATION.

PARTICULATE RESPIRATORY PROTECTION IS REQUIRED REGARDLESS OF AIRBORNE HYDROCARBON VAPOR CONCENTRATION.

8. OPEN the top manhole on T-101.
9. The GAC Service Vendor will remove and replace the GAC.
10. VERIFY that the GAC transportation and regeneration hazardous waste manifest is properly completed. The manifest will be signed only by an authorized Defense Energy Support Center (DESC) employee.
11. CLOSE and TIGHTEN the top manhole on T-101.
12. OPEN Vapor-Phase GAC Bed T-102 Inlet Valve, HV-113.
13. OPEN Vapor-Phase GAC Bed T-101 From T-102 Inlet Valve, HV-116.
14. OPEN Vapor-Phase GAC Bed T-101 Effluent Valve, HV-115.
15. CLEAR Lockout/Tagout from B-100.
16. START the System per Section 3.1.2.2 of these procedures.

3.1.2.5.3 **Replacement of Vapor-Phase GAC if Vapor-Phase GAC Bed T-102 is primary bed:**

1. When the concentration of volatile hydrocarbons at Vapor-Phase GAC Bed T-101 Sample Valve, AP-104, is 10 percent of the concentration at Vapor-Phase GAC Bed T-102 Sample Valve, AP-105, (but greater than 10 ppmv) PERFORM the following:
2. SHUT DOWN the System per section 3.1.2.4 of the procedures.
3. Make arrangements with the GAC service vendor to remove, regenerate and replace the GAC in T-102.
4. LOCKOUT/TAGOUT Air Stripper Blower, B-100.
5. CLOSE Vapor-Phase GAC Bed T-102 Inlet Valve, HV-113.
6. CLOSE Vapor-Phase GAC Bed T-101 From T-102 Inlet Valve, HV-116.
7. CLOSE Vapor-Phase GAC Bed T-101 Effluent Valve, HV-115.

WARNING! GAC BED ATMOSPHERES MAY BE OXYGEN DEFICIENT AND HAVE HIGH HYDROCARBON CONCENTRATIONS. DO NOT ENTER THE BED. MONITOR HYDROCARBON VAPOR CONCENTRATIONS IN THE BREATHING ZONE USING A FID OR PID WHILE THE BED IS OPEN. THE PEL FOR HYDROCARBON VAPORS IS 300 PPM.

IF THE HYDROCARBON VAPOR CONCENTRATION AT ANY LOCATION EXCEEDS THE SCALE ON THE FID OR PID, MONITOR CONCENTRATIONS USING A FLAMMABLE GAS METER. DO NOT ALLOW THE HYDROCARBON CONCENTRATION TO EXCEED 20 PERCENT OF LEL AT ANY LOCATION.

PARTICULATE RESPIRATORY PROTECTION IS REQUIRED REGARDLESS OF AIRBORNE HYDROCARBON VAPOR CONCENTRATION.

8. OPEN the top manhole on T-102.
9. The GAC Service Vendor will remove and replace the GAC.

10. VERIFY that the GAC transportation and regeneration hazardous waste manifest is properly completed. The manifest will be signed only by an authorized DESC employee.
11. CLOSE and TIGHTEN the top manhole on T-102.
12. OPEN Vapor-Phase GAC Bed T-101 Inlet Valve, HV-112.
13. OPEN Vapor-Phase GAC Bed T-102 From T-101 Inlet Valve, HV-114.
14. OPEN Vapor-Phase GAC Bed T-102 Effluent Valve, HV-117.
15. CLEAR Lockout/Tagout from B-100.
16. START the System per Section 3.1.2.2 of these procedures.

3.1.2.5.4 **Replacement of Liquid Phase GAC**

1. When the concentration of dissolved hydrocarbons at Liquid Phase GAC Midpoint Sample Valve, AP-109, is 10 percent of the concentration at Air Stripper Effluent Sample Valve, AP-103, PERFORM the following:
2. SHUT DOWN the System per section 3.1.2.4 of the procedures.
3. Make arrangements with the GAC service vendor to remove, regenerate and replace the GAC in T-103.
4. LOCKOUT/TAGOUT Air Stripper Effluent Pump, P-101.
5. CLOSE Air Stripper Effluent Pump Discharge Valve, HV-118.

WARNING! GAC BED ATMOSPHERES MAY BE OXYGEN DEFICIENT AND HAVE HIGH HYDROCARBON CONCENTRATIONS. DO NOT ENTER THE BED. MONITOR HYDROCARBON VAPOR CONCENTRATIONS IN THE BREATHING ZONE USING A FID OR PID WHILE THE BED IS OPEN. THE PEL FOR HYDROCARBON VAPORS IS 300 PPM.

IF THE HYDROCARBON VAPOR CONCENTRATION AT ANY LOCATION EXCEEDS THE SCALE ON THE FID OR PID, MONITOR CONCENTRATIONS USING A FLAMMABLE GAS METER. DO NOT ALLOW THE HYDROCARBON CONCENTRATION TO EXCEED 20 PERCENT OF LEL AT ANY LOCATION.

PARTICULATE RESPIRATORY PROTECTION IS REQUIRED REGARDLESS OF AIRBORNE HYDROCARBON VAPOR CONCENTRATION.

6. OPEN the top manhole on T-103.
7. The GAC Service Vendor will remove and replace the GAC.
8. VERIFY that the GAC transportation and regeneration hazardous waste manifest is properly completed. The manifest will be signed only by an authorized DESC employee.
9. CLOSE and TIGHTEN the top manhole on T-103.
10. OPEN HV-118.
11. CLEAR Lockout/Tagout from P-101.
12. CONNECT a clean, fresh water supply to GAC Fill Valve, HV-120.

13. FILL Liquid Phase GAC Beds T-103 and T-104 with clean, fresh water by OPENING HV-120 until water vents from AP-109.
14. CLOSE AP-109. CONTINUE to FILL T-103 and T-104 until water vents from AP-103.
15. CLOSE HV-120.
16. IF water continues to drain from AP-103, CLOSE AP-103.
17. DISCONNECT water supply from HV-120.
18. START the system per Section 3.1.2.2 of these procedures.

3.1.2.5.5 High Product Storage Tank Level, LSH-201 or LSHH-201

19. SHUT DOWN the System per section 3.1.2.4 of the procedures.
20. Make arrangements with the used oil service vendor to remove the liquid hydrocarbons in T-200.
21. VERIFY that the used oil transportation and regeneration hazardous waste manifest is properly completed. The manifest will be signed only by an authorized DESC employee.
22. CLOSE and TIGHTEN the top manhole on T-200.
23. START the System per Section 3.1.2.2 of these procedures.

3.1.2.5.6 High Groundwater Filter Differential Pressure, PDSH-1

1. TURN the P-1 Hand-Off-Auto Switch to OFF.
2. CLOSE Filter F-1 Outlet Valve, HV-5.
3. OPEN Sump V-1 Sample Valve, AP-1, until pressure at PI-1 is zero.
4. CLOSE AP-1.
5. CLOSE Filter F-1 Inlet Valve, HV-4.
6. SLOWLY REMOVE Filter F-1 cover.
7. REPLACE the filter elements with seven new elements per the manufacturer's instructions.
8. DISCARD the used filter elements in the solid waste drum for disposal.
9. OPEN HV-4.
10. OPEN HV-5.
11. TURN the P-1 Hand-Off-Auto Switch to AUTO.

3.1.2.5.7 High Groundwater Filter Differential Pressure, PDSH-2

1. CLOSE Sump V-3 Outlet Valve, HV-10.
2. TURN the P-2 Hand-Off-Auto Switch to OFF.
3. CLOSE Filter F-2 Outlet Valve, HV-7.
4. OPEN Sump V-2 Sample Valve, AP-3, until pressure at PI-2 is zero.
5. CLOSE AP-3.
6. CLOSE Filter F-2 Inlet Valve, HV-6.
7. SLOWLY REMOVE Filter F-2 cover.
8. REPLACE the filter elements with seven new elements per the manufacturer's instructions.

9. DISCARD the used filter elements in the solid waste drum for disposal.
10. OPEN HV-6.
11. OPEN HV-7.
12. TURN the P-2 Hand-Off-Auto Switch to AUTO.
13. OPEN HV-10.

3.1.2.5.8 **High Effluent Sample Results**

Effluent Concentration Limits are as follows:

- pH: >6.5, <8.5
- EPA 8260B, each VOC compound: 5.0 µg/L, except: vinyl chloride, 0.5 µg/L; carbon tetrachloride, 0.5 µg/L; 1,2-dichloroethane, 0.5 µg/L; and benzene, 1.0 µg/L
- EPA 610, each polynuclear aromatic hydrocarbon: 15 µg/L
- EPA 625 or 8270C, each SVOC: 5.0 µg/L
- Aquatic Toxicity: 90 percent survival
- Arsenic 1.0 grams/day (gr/day)
- Cadmium 1.0 gr/day
- Chromium 2.0 gr/day
- Copper 3.0 gr/day
- Lead 5.0 gr/day
- Mercury: 0.01 gr/day
- Nickel 5.0 gr/day
- Selenium: 2.0 gr/day
- Silver 1.0 gr/day
- Zinc 10 gr/day

1. If any sample result exceeds the Effluent Concentration Limits, REPEAT the sample daily, with a 24-hour turnaround.
2. NOTIFY the RWQCB by phone (510/622-2492).
3. NOTIFY the RWQCB by mail within seven days:

California Regional Water Quality Control Board
San Francisco Bay Region
1515 Clay Street, Suite 1400
Oakland, CA 94612

3.1.3 Maintenance Requirements

The following maintenance schedule is established:

Equipment	Frequency	Action
System Readings	Twice per week	Take System Readings per section 3.1.2.2.7. Check level in Acid Storage Tank, T-016. Check level in Product Storage Tank, T-200.
pH Control System	Every Month	Calibrate pH analyzer loop, AE-100 and AIC-100.
Oil/Water Separator, V-5	Every month	Clean and inspect. Verify no gap exceeding 1/8-in. exists in lid seals. Repair as required.
Level Switches	Every month	Clean, inspect and test operation
Air Stripper Blower, B-100	Every month	Clean Inlet Filter/Silencer
	Every 6 months	Grease motor bearings
Recovery Well Pump, P-100	Every month	Clean and inspect
Air Stripper Effluent Pump, P-101	Every 6 months	Grease motor bearings
Air Stripper Feed Pump, P-102	Every 6 months	Grease motor bearings
Lift Station Sump Pumps, P-1 and P-2	Every 3 months	Clean, inspect and test operation

3.2 GENERATOR BUILDING SPH RECOVERY SYSTEM

3.2.1 Introduction

The GBSRS was installed to recover separate-phase and dissolved-phase hydrocarbons encountered on and in the groundwater near the Generator Building and to maintain the groundwater level below the bottom of the diesel generator sump.

3.2.2 Operating Procedures

3.2.2.1 Initial Conditions

3.2.2.1.1 Valve Positions

1. Transfer Tank Outlet Valve, HV-110, is OPEN.
2. Groundwater Sample Valve, SP-111, is CLOSED.
3. Transfer Pump Outlet Valve, HV-111, is OPEN.
4. Oil/Water Separator Sample Valve, SP-110, is CLOSED.
5. Recovery Well G-57 Pump Outlet Valve, HV-112, is OPEN.
6. Sump Pump Outlet Valve, HV-113, is OPEN.
7. Air compressor outlet valve is OPEN.

3.2.2.1.2 Electrical Lineup

1. Main Disconnect to GBSRS is CLOSED.
2. VERIFY Circuit Breaker for Air Compressor, C-301, is ON.
3. VERIFY Circuit Breaker for Transfer Pump, P-111, is ON.
4. VERIFY Circuit Breaker for Sump Pump, P-112, is ON.
5. VERIFY Circuit Breaker for Control Circuit is ON.
6. VERIFY Circuit Breaker for Exterior Sump Pump, P-113, is ON.
7. VERIFY TFGRS is in operation.

3.2.2.2 Start Generator Building SPH Recovery System

3.2.2.2.1 Start Recovery System

1. TURN Air Compressor pressure switch control to AUTO.
2. VERIFY Air Compressor starts.
3. WHEN air pressure reaches 100 psig, TURN Transfer Pump switch to AUTO.
4. TURN Total Fluids Pump switch to AUTO.
5. TURN Exterior Sump Pump switch to AUTO.
6. WHEN water level in Transfer Tank T-110 reaches the high level switch probes, VERIFY the Transfer Pump, P-111, pumps the tank contents to the TFGRS.

3.2.2.2.2 Check System Instrumentation

1. RECORD the following information while P-110, P-111 and C-301 are running (Use Site Visit Form in Appendix B-4.):
   - Air Compressor pressure
   - Air Compressor cycle time
   - Air line pressure
   - Volume of water pumped at FIQ-110
   - P-111 pressure

- P-111 flow rate
- Depth to water in well G-57
- Depth to product in well G-57
- P-110 cycle counter
- P-110 cycle frequency
- Depth of P-110
- P-110 discharge pressure
- Volume of water pumped by P-110 at flow totalizer
- Depth to water in well G-56
- Depth to product in well G-56
- Depth to water in Product Storage Tank, T-210
- Depth to product in T-210
- VERIFY the OWS is operating properly and the lid is sealed

3.2.2.3 System Shutdown

1. RECORD the following information while P-110, P-111 and C-301 are running (Use Site Visit Form in Appendix B-4.):
   - Air Compressor pressure
   - Air Compressor cycle time
   - Air line pressure
   - Volume of water pumped at FIQ-110
   - P-111 pressure
   - P-111 flow rate
   - Depth to water in well G-57
   - Depth to product in well G-57
   - P-110 cycle counter
   - P-110 cycle frequency
   - Depth of P-110
   - P-110 discharge pressure
   - Volume of water pumped by P-110 at flow totalizer
   - Depth to water in well G-56
   - Depth to product in well G-56
   - Depth to water in Product Storage Tank, T-210
   - Depth to product in T-210
2. TURN Transfer Pump switch to OFF.
3. TURN Total Fluids Pump switch to OFF.
4. TURN Exterior Sump Pump switch to OFF.
5. IF the TFGRS is to remain in operation, leave the Air Compressor pressure switch in AUTO.

3.2.2.4 Alarm Condition Responses

3.2.2.4.1 High Product Storage Tank Level, LSHH-210

1. SHUT DOWN the System per section 3.2.2.3 of the procedures.

2. Make arrangements with the used oil service vendor to remove the liquid hydrocarbons in T-210.
3. VERIFY that the used oil transportation and regeneration hazardous waste manifest is properly completed. The manifest will be signed only by an authorized DFSP-Ozol employee.
4. CLOSE and TIGHTEN the top manhole on T-210.
5. START the System per Section 3.2.2.2 of these procedures.

3.2.3 Maintenance Requirements

The following maintenance schedule is established:

Equipment	Frequency	Action
System Readings	Twice per week	Take System Readings per section 3.2.2.2.2. Check level in Product Storage Tank, T-210.
Recovery Well Pump, P-110	Every month	Clean and inspect
Oil/Water Separator, V-110	Every month	Clean and inspect. Verify no gap exceeding 1/8-in. exists in lid seals. Repair as required.
Level Switches	Every month	Clean, inspect and test operation
Sump Pumps, P-112 and P-113	Every 3 months	Clean, inspect and test operation

3.3 SEPARATE-PHASE PASSIVE RECOVERY

3.3.1 Introduction

SPH has been observed in several monitoring wells across the site. Eighteen of these wells are monitored monthly to measure the thickness of SPH on the groundwater. Fourteen of these wells contain passive skimmers to collect the SPH. These skimmers are inspected and emptied monthly. The quantity of SPH from each well is recorded and the collected SPH is placed in Product Storage Tank T-200 at the TFGRS. When tank T-200 is full, empty the tank using the procedure in Section 3.1.2.5.5.

3.3.2 Maintenance Requirements

The following maintenance schedule is established:

Well Numbers	Frequency	Action
2A, 4, 6B, DM-41, DM-44, DM-45, DM-46, EA-33, G-56, G-68, M-11, M-15, M-21, M-22	Every month	Measure depth to water (DTW), depth to product (DTP) and volume of SPH removed. Adjust height of skimmer as required.
EA-28, EA-31, EA-36, G-57	Every month	Measure DTW and DTP.

4.0 GROUNDS MAINTENANCE

In addition to the environmental monitoring, sampling and remediation requirements, the caretaker is responsible for maintaining the facility.

4.1 PIPELINE INTEGRITY

An 8-inch pipeline connects the Ozol facility and the Concord Pump Station to allow fuel to be transferred to or from Ozol. The pipeline route is shown on the drawing in Appendix C-1. The integrity of the pipeline between the Ozol facility and the Concord Pump Station is monitored by pressurizing the line with nitrogen and observing the pressure. Dry nitrogen gas is used to limit the amount of internal corrosion in the pipeline. Leakage, whether through valves, pipe wall corrosion or a breach in the pipeline wall will be indicated by a drop in nitrogen pressure.

The pipeline is initially pressurized to 150 psig with bottled nitrogen using fittings at the Ozol end of the pipeline. The pressure is monitored weekly. Unless there is a rapid drop in pressure, the pipeline should be recharged if the pressure drops to 60 psig. A slow drop in pressure (over the time of at least one year) indicates valve leakage or a corrosion leak that is likely too small to locate.

In case of a rapid drop in pressure, inspect the length of the pipeline and notify DESC.

4.2 CATHODIC PROTECTION

4.2.1 Description

The cathodic protection systems are designed to protect underground portions of the Ozol piping and fuel tanks. Two types of systems are used: sacrificial anodes and impressed current. The 8-inch pipeline between the Ozol facility and the Concord Pump Station, the underground fuel lines from the bulk storage tanks and the bulk storage tanks are protected by an impressed current system. This system uses a rectifier to apply a direct current (DC) voltage between the

underground piping or tanks and an underground anode. Rectifiers are located at the Concord Pump Station, north of the barge booster pumps at the Ozol Facility, and at the service building near the tank farm fuel piping manifold.

The fire protection tank, T-1, fire protection piping and wharf are protected by sacrificial anodes. Sacrificial anodes are more electrochemically active than the steel or iron piping and protect the piping by corroding in preference to the piping.

Annually, a cathodic protection engineer should evaluate the entire cathodic protection system for effectiveness. The last cathodic protection system evaluation is included in Appendix C-2. This evaluation shall include:

- Checking and comparing the previous 12-month readings for patterns of deviations
- If comparisons do not indicate any unacceptable deviations, the cathodic protection system can be considered functional.
- Indications of a deteriorating pattern of cathodic protection require further system evaluation by the cathodic protection engineer.

4.2.2 Maintenance Requirements

The following maintenance schedule is established:

Well Number	Frequency	Action
Rectifiers	Every month	Verify power is supplied to the rectifiers.
System	Annually	Inspection of entire system by Cathodic Protection Engineer.

4.3 DIESEL GENERATOR

4.3.1 Introduction

The backup diesel generator is installed to provide backup electrical power for operation of the Ozol facility in case of an extended power outage. The six-cylinder Nordberg generator is rated at 1,000 kilowatts (kW) at 514 revolutions per minute (rpm). Fuel for the generator has been removed from the diesel storage tank. The generator is rotated by hand (barred over) 2¼ or 2½ turns every month to prevent crankshaft deflection.

4.3.2 Testing, Service and Maintenance of Diesel Engine

The following maintenance schedule is established:

Equipment	Frequency	Action
Generator Sump	Every week	Check for water in the sump. If water is present, check the exterior sump pump for proper operation.
Diesel Engine	Every month	Start electric lubricating oil pump. Rotate engine by hand (bar over) 2 ¼ to 2 ½ turns. Stop electric lubricating oil pump after ½ hour.
Lubricating Oil System	Every six months	Check inlet and discharge strainers for cleanliness.

4.4 *FIRE PROTECTION SYSTEM*

4.4.1 Introduction

The Ozol fire protection system provides fire protection water to all areas of the facility. Water is stored in a 200,000-gallon tank, T-1, located just below the upper gate into the tank farm. Tank T-1 is filled by pump P-1, located near the truck loading facilities. Pump P-1 is supplied from a Contra Costa Water District (CCWD) pipeline located along the railroad tracks passing by the facility. Fire hydrants, and monitors in the lower terminal and wharf area are fed by gravity from tank T-1. The hydrants in the tank farm are fed by fire booster pump P-2, located at Tank T-1. Pressure in the water line feeding the tank farm hydrants is maintained by fire jockey pump P-3, located next to pump P-2.

The fire monitors (water cannons) at the truck loading facility and wharf, and the sprinklers in the diesel generator building have the capability of being fed with a 3% solution of aqueous film forming foam (AFFF), but the foam concentrate tanks have been emptied.

4.4.2 Installed Fire Water Equipment

4.4.2.1 Water Storage Tank T-1

The fire protection water is stored in a 200,000-gallon storage tank located on the tank farm.

This tank supplies the lower terminal, wharf and transmix basin hydrants with water by gravity flow. The upper tank farm is supplied, but booster pumps are required to supply water flow to those hydrants.

The tank is equipped with a Varec automatic gauge and a Varec 1900 Series Microprocessor transmitter that transmits the tank level to the Varec 6680 Series Master Terminal Unit (CRT) screen located in the administration office. (The transmitter and Master Terminal Unit are de-energized.)

Interior mounted float switches are designed to actuate relay contacts that start water booster pump P-1 located at the lower terminal area. The pump is automatically turned off when the water level in the tank reaches the high setting. The float switches are not functional and the pump must be started and stopped manually.

4.4.2.2 Pump P - 1, Terminal Booster Pump

This pump is used to supply water to the fire protection system water tank T-1. It is operated in the hand mode. The auto mode is not functional.

The pump delivers 500 gallons of water per minute and is driven by a 50 horsepower - 3,535 RPM electric motor.

4.4.2.3 Pump P - 2, Tank Farm Booster Pump

This pump is used to supply water to the fire protection water hydrants located on the storage tank tops. It is supplied water from the storage tank T-1. It can be operated in an automatic mode or in a hand mode. If operated in the auto mode, pressure switches at the pump pad will activate the pump to start. When the set pressure is established, it will cycle upon water demand/flow from the hydrant stations.

The pump delivers 500 gallons of water per minute and is driven by a 60 horsepower - 3,555 RPM electric motor.

4.4.2.4 Pump P - 3, Tank Farm Jockey Pump

This pump is used in conjunction with pump P-2 to supply fire water to the hydrants located on the storage tank tops. Its purpose is to maintain a constant pressure at the hydrant stations during a flow condition, thereby eliminating P-2 pump from excessive cycling. It can be operated in an automatic mode or in a hand mode. If operated in the auto mode, pressure switches at the pump pad will activate the pump to start. When the set pressure is established, it will cycle upon water demand/flow from the hydrant stations.

The pump is a flexible coupling drive peripheral pump and driven by a 7.5 horsepower - 3,470 RPM electric motor.

4.4.3 AFFF System

4.4.3.1 Truck Rack

The truck rack is protected by two (2) oscillating foam monitors that cover the truck rack apron with a foam cover when the system is manually activated by opening control valves at the foam tank D-1 location. Detailed operating instructions are posted on the side of the tank. (Note that foam tank D-1 has been emptied of foam concentrate. The monitors will spray water only, which should not be used on a fuel fire, as it will spread the burning fuel.)

4.4.3.2 Diesel Building

The diesel/generator building is protected by a wet-pipe overhead foam sprinkler system and two (2) hose reels located outside the building at each end with 100 feet of hose on each reel. The reels are primarily designed to cover the pumping manifolds across the Street from the building. Operating instructions are posted on the side of the AFFF tank D-2. (Note that foam tank D-2 has been emptied of foam concentrate. The sprinklers and hoses will spray water only, which should not be used on a fuel fire, as it will spread the burning fuel.)

4.4.3.3 Wharf

The wharf is protected by six (6) hydrants along the wharf catwalk and manifold area. The catwalk hydrants have 2½ inch hose outlets with AFFF capability.

The wharf manifold area is protected by standpipe monitor nozzles with foam capability from foam tank D-1 located in the main terminal complex.

4.4.3.4 AFFF Foam Tanks

Although the AFFF Foam tanks are described below they have been emptied as indicated above.

4.4.3.4.1 D-1, Truck Rack

The foam tank D-1 is a 1,000 gallon capacity tank located adjacent to the truck loading rack apron that supplies foam to either the truck loading rack or the wharf. Manually operated gate valves direct flow to either system. The water supply for the foam proportioning system comes from the water tank T-1 located on the tank farm and is gravity fed from that point.
All control valves at tank D-1 site are numbered and have identification plates on the valves that correspond with the operating instructions located on the side of the tank.

4.4.3.4.2 D-2, Diesel Building

The foam tank D-2 is a 200 gallon capacity tank located next to the diesel/generator building that supplies foam to the wet-pipe sprinkler system inside the building or the hose reels located outside the building at each end.

4.4.4 Fire Equipment Operating Instructions — Installed Systems

4.4.4.1 Truck Loading Rack System

In case of fire at the truck loading rack:

Step	Action	Valve No.	Description	Normal Position
1.	VERIFY OPEN	1	Tank D-1 Water Control Valve	Open
2.	VERIFY OPEN	2	Concentrate Isolation Valve	Open
3.	OPEN	3	Water Inlet Valve	Closed
4.	OPEN	4	Dock Control Valve	Closed
5.	OPEN	5	Truck Rack Control Valve	Closed
6.	VERIFY OPEN	6	Monitor Control Valves Truck Rack Oscillators	Open

4.4.4.2 Diesel/Generator Building — Sprinkler or Hose Reel Operation

The system installed at the diesel/generator building is equipped with an automatic alarm system that will ring if a fire should occur inside the diesel building. The sprinkler system is automatically actuated by heat or flames when the temperature reaches approximately 285°F. When the sprinkler seal is melted, water will flow through the piping system and out through the sprinkler head, this sudden flow of water through the piping system will actuate the alarm system.

In case of fire inside the diesel/generator building:

Step	Action	Valve No.	Description	Normal Position
1.	VERIFY OPEN	1	System Control Valve	Open
2.	OPEN	2	Tank Pressure Inlet Valve	Closed
3.	VERIFY OPEN	3	Concentrate Isolation Valve	Open
4.	OPEN	4	Hose Reel Control Valve (Used for fire containment at piping and pump manifolds)	Closed
5.	OPEN	5	To test the alarm system, open valve to actuate alarm bell	Closed

4.4.4.3 Wharf Fire System

The wharf has a total of six (6) fire hydrants with each having the capability for AFFF application.

The entire wharf system is controlled through AFFF tank D-1. The Wharf Control Valve No. 5 must be opened to supply the system with water and/or foam concentrate.

4.4.4.3.1 *Hydrants*

Along the catwalk extending out to the fuel transfer location, there are a total of three standpipe hydrants, each having double connections for 2½ inch fire hose.

4.4.4.3.2 Monitors

At the wharf manifold area, there are three (3) stationary standpipe stations mounted with swiveling monitors for stationary water application where needed.

Foam application to the wharf system is achieved as outlined for the Truck Rack System.

In case of fire at the wharf:

Step	Action	Valve No.	Description	Normal Position
1.	VERIFY OPEN	1	Tank D-1 Water Control Valve	Open
2.	VERIFY OPEN	2	Concentrate Isolation Valve	Open
3.	OPEN	3	Water Inlet Valve	Closed
4.	OPEN	4	Dock Control Valve	Closed

4.4.4.3.3 Spare Sprinkler Heads

Spare sprinkler heads for the diesel/generator system are located in a red box mounted next to the lighting circuit panel in diesel generator building. This box is sealed at all times.

4.4.5 Testing, Service and Maintenance of Fire System Booster Pumps

The following maintenance schedule is established:

Equipment	Frequency	Action
T-1	Every week	Check water level, if less than 29 ft, fill to 31 feet with P-1. The tank fills at a rate of approximately 1 inch per minute.
P-1	Every month	Check stuffing box for excessive leakage. Some leakage is required for stuffing lubrication.
	Every 6 months	Lubricate bearings.
P-2	Every month	Check stuffing box for excessive leakage. Some leakage is required for stuffing lubrication.
	Every 6 months	Lubricate bearings.
P-3	Every month	Check stuffing box for excessive leakage. Some leakage is required for stuffing lubrication.
	Every 6 months	Lubricate bearings.

A red log book entitled "Fire Protection System" is maintained for documentation of all testing, service and maintenance.

4.4.6 Pressure Switch Settings in Auto Mode

Water Booster Pump, P-2	On @ 100 ± PSI (w/ 5 sec delay)
	Off @ 140 ± PSI (w/ 5 sec delay)
Jockey Pump, P-3	On @ 95 ± PSI
	Off @ 125 ± PSI

4.5 WEED ABATEMENT

In order to minimize the risk of fire spreading at the facility and to permit access to equipment, weeds are abated. In the tank farm area, sheep are used to eat the vegetation. Sheep are not used in other areas because they can escape. Water for the sheep is provided from the fire protection

system through a spigot at a trough near the air pollution abatement. The trough will be checked weekly and refilled as needed. The sheep belong to:

Harry Robinson
(W) (925) 798-8818
(H) (925) 837-9329

All other areas, including the terminal area, wharf area and Concord Pump Station will have weeds cleared by mowing or cutting. Weeds will be mowed or cut annually in the spring after winter rains have stopped, and before June 1.

5.0 SECURITY

5.1 PHYSICAL SECURITY

The Ozol Facility and Concord Pump Stations are surrounded by chain-link fences. The gates are locked with interlinking locks belonging to several organizations. These organizations include: Pacific Gas & Electric (PG&E), US Coast Guard (Ozol), Contra Costa Water District (CCWD), Southern Pacific Transportation Company (S.P.T. Co.), Kinder Morgan Energy Partners, L.P. (Concord), and East Bay Regional Park District (EBRPD, Ozol). Access for these organizations must be maintained.

5.2 SITE INSPECTIONS

The following maintenance schedule is established:

Equipment	Frequency	Action
Buildings	Every week	Inspect window coverings and locks and repair as required.
		Inspect for water leakage.
		Inspect that locks are secure.
Fences	Every week	Inspect for holes and repair as required.
Gates	Every week	Inspect that locks are secure.
Above and Underground Piping	Every week	Inspect for leakage. Report any leakage to DESC.
Perimeter	Every month	Inspect perimeter signs and refasten or replace as necesssary.

Equipment	Frequency	Action
Hillsides	Every 6 months	Inspect for slides or subsidence. Report any slides or subsidence to DESC

5.3 PIER LIGHTING

The pier lighting system is left on in automatic mode. The lights are on from dusk to dawn and are controlled by a photocell. The switch for the lighting is located on the wharf walkway.

6.0 UNDERGROUND SERVICE ALERT

The DFSP Ozol facility participates in the Underground Service Alert (USA) system for its underground pipeline that runs from the terminal, eastward 7.6 miles to the Concord Pump Station (Appendix C-1, Figure 3). Once a member of this program, USA notifies the member if digging is planned in the vicinity of their underground utility. Notification is typically via e-mail. The annual membership fee (paid by contractor) is approximately $60.

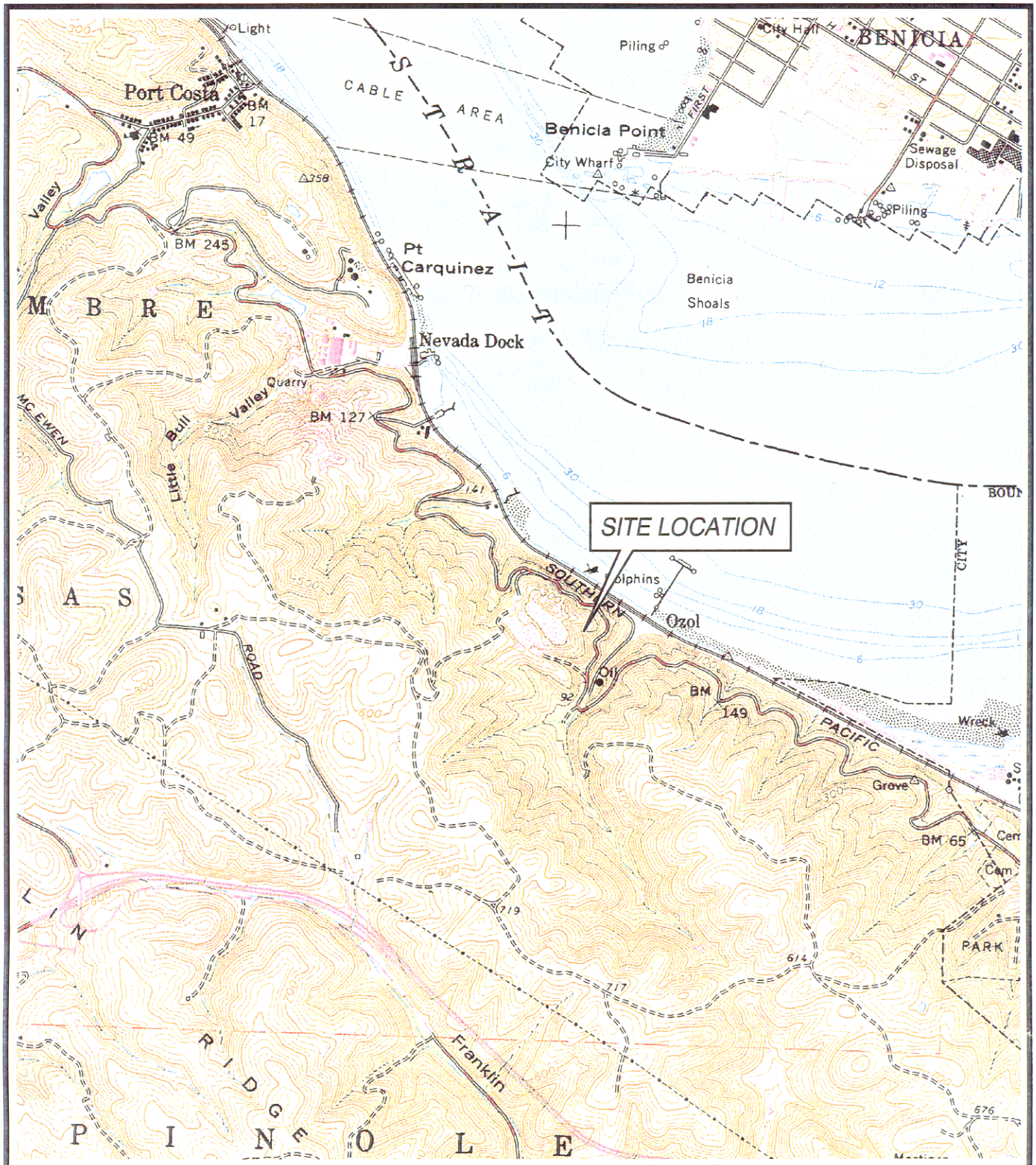
To be authorized as a responder, DESC must send a letter to USA indicating the contractor who is to receive notifications. Once this is established, notifications will start being made. At this time, approximately 40 notifications per month are received.

Once notifications are received, the Thomas Street Guide and Directory for Contra Costa County is consulted for location of the digging project. If the project is within the vicinity of the pipeline, a contractor staff member familiar with the pipeline location is dispatched to the area to see if the underground work would impact the pipeline in any way. A set of detailed drawings that depict the location and depth-of-burial of the pipeline are brought to the field (DFSP Ozol, California, DFSC F-458 As-Built Drawing set). The pipeline location is marked in yellow paint. In cases where the digging project is close to the pipeline, or the pipeline location is uncertain, a professional utility locator is called out to mark the location.

All notification tickets must be maintained in the permanent project file.

APPENDIX A-1

FIGURES AND TABLES



GROUNDWATER TECHNOLOGY, INC. A MEMBER OF THE IT GROUP SOURCE: U.S.G.S. 7.5' QUAD SHEET BENICIA, CALIFORNIA PHOTOREVISED 1979	N	SCALE: 0 FEET 2000	SITE LOCATION MAP
		CLIENT: DEFENSE ENERGY SUPPORT CENTER DESC OZOL	DATE: 1/21/99
		LOCATION: 700 CARQUINEZ SCENIC DR. MARTINEZ, CALIFORNIA	FIGURE: 1

IMAGE	X-REF	OFFICE	DRAWN BY	CHECKED BY	APPROVED BY	DRAWING NUMBER
	---	Concord	SJZ 11/30/01			832304-B2

CARQUINEZ STRAIT

PIER

LEGEND
- MONITORING WELL
- EXTRACTION WELL
- TC TREATMENT COMPOUND

EA38 M17 DM48 DM49 EA30 EA25 01 10 M16 EA27 EA37 DM43 C8 C2A C2B G67 G68 DM45 T836 T837 EA36 T838 M22 DM44 T8310 UPPER TANK AREA T839 M21 T8312 T834 M23 M24 T8311 07 EA33 T835 DM46 T833 LOWER TANK AREA T832 DM47 EA29 T831 EA31 M14 POND B SPRING NO. 2 SPRING NO. 3 SPRING NO. 1 PIPES EA34 03 04 13 TC12 05 M20 M15 G66 09 RW1 06B RW2 G51 G50 DM41 DM42 EA35 EA26 M18 OFFICE GENERATOR BUILDING G53 TC TANK TRUCK LOADING AREA DM39 G63 G64 G62 DM40 G61 G60 G57 G56 G58 G54 G55 G59 G52 G65

CARQUINEZ SCENIC DRIVE

N

SCALE
0 200 400FEET

GROUNDWATER TECHNOLOGY, INC. A MEMBER OF THE IT GROUP	DEFENSE ENERGY SUPPORT CENTER DFSC OZOL 700 CARQUINEZ SCENIC DR. MARTINEZ, CALIFORNIA

FIGURE 2

SITE PLAN

Table 1
Well Sampling Schedule

Well	Semiannual May	Semiannual October
01	X	X
02A	X	X
02B	X	X
03	X	
04	X	X
05	X	
06B	X	X
07	X	X
08	X	X
09	X	X
11	X	X
DM39	X	X
DM40	X	X
DM41	X	X
DM42	X	
DM43	X	
DM44	X	X
DM45	X	X
DM46	X	X
DM47	X	X
DM48	X	X
DM49	X	X
EA25	X	X
EA26	X	X
EA27	X	X
EA28	X	X
EA29	X	X
EA30	X	
EA31	X	X
EA33	X	X
EA34	X	X
EA35	X	X
EA36	X	X
EA37	X	
EA38	X	X
G50	X	X
G51	X	X
G52	X	X
G53	X	X
G54	X	X
G55	X	X
G56	X	X
G57	X	X
G58	X	X

Table 1
Well Sampling Schedule
(continued)

Well	Semiannual May	Semiannual October
G59	X	X
G60	X	X
G61	X	X
G62	X	X
G63	X	X
G64	X	X
G65	X	X
G66	X	X
G67	X	X
G68	X	X
M14	X	X
M15	X	X
M16	X	X
M17	X	X
M18	X	X
M19	X	X
M20	X	
M21	X	X
M22	X	X
M23	X	
M24	X	
RW2	X	X

Table 2
Well Construction Details

Site	Completion Depth (feet bgs)	Casing Diameter (inches)	Screened Interval (feet bgs)		Ground Surface Elevation [1]	Measuring Point Elevation [1] (feet)
			Top	Bottom		
01	43.70	2.00	24.70	43.70	303.80	303.80
02A	34.70	2.00	9.70	34.70	251.99	251.99
02B	39.90	2.00	29.90	39.90	251.06	251.06
03	39.90	2.00	9.90	39.90	272.32	272.32
04	22.60	2.00	5.60	22.60	252.37	252.37
05	17.40	2.00	7.40	17.40	233.92	233.92
06B	22.60	2.00	5.60	22.60	235.20	235.20
07	61.60	2.00	26.60	61.60	321.10	321.10
08	41.50	2.00	21.50	41.50	295.58	295.58
09	50.00	2.00	30.00	50.00	220.97	220.97
11	30.00	2.00	10.00	30.00	178.90	178.90
DM39	18.50	4.00	3.00	18.00	19.33	22.21
DM40	21.50	4.00	6.00	21.00	22.20	25.04
DM41	28.30	4.00	20.00	28.00	116.95	116.39
DM42	28.50	4.00	14.50	28.00	93.69	96.28
DM43	138.50	4.00	118.00	138.00	289.23	291.67
DM44	53.50	4.00	48.00	53.00	358.16	360.69
DM45	43.50	4.00	38.00	43.00	295.95	297.92
DM46	44.50	4.00	30.00	44.50	336.54	338.90
DM47	133.50	4.00	103.00	133.00	324.39	327.19
DM48	70.00	4.00	59.50	69.50	206.53	212.37
DM49	35.50	4.00	20.00	35.00	167.72	170.23
EA25	101.00	5.00	40.00	101.00	300.75	300.75
EA26	35.00	5.00	4.00	35.00	141.26	141.26
EA27	96.00	5.00	65.00	96.00	337.00	338.00
EA28	82.00	5.00	25.00	82.00	296.94	296.94
EA29	100.00	5.00	20.00	100.00	287.36	287.36
EA30	50.00	5.00	10.00	50.00	167.25	167.25
EA31	65.00	5.00	20.00	65.00	290.53	290.53
EA33	87.00	5.00	51.00	87.00	317.56	317.56
EA34	80.00	5.00	5.00	80.00	256.20	256.20
EA35	35.00	5.00	5.00	35.00	54.84	54.48
EA36	70.00	5.00	33.00	70.00	361.51	361.51
EA37	55.00	5.00	17.00	55.00	184.87	187.87
EA38	79.00	5.00	29.00	79.00	202.40	202.40
G50	20.00	2.00	5.00	20.00	194.50	196.91
G51	20.00	2.00	5.00	20.00	203.00	205.35
G52	25.00	2.00	5.00	25.00	41.78	41.78
G53	24.80	2.00	4.80	24.80	40.94	40.70
G54	29.80	2.00	9.80	29.80	40.65	40.04
G55	25.00	2.00	12.00	25.00	34.02	33.68

Table 2
Well Construction Details
(continued)

G56	25.00	2.00	5.00 — 25.00	31.13	30.75
G57	40.00	6.00	10.00 — 40.00	28.44	27.02
G58	19.80	2.00	4.80 — 19.80	26.39	25.92
G59	32.00	2.00	14.00 — 32.00	31.60	33.72
G60	25.00	2.00	12.00 — 25.00	23.68	23.12
G61	20.00	2.00	5.00 — 32.00	19.74	19.51
G62	30.00	2.00	15.00 — 30.00	27.21	26.56
G63	25.00	2.00	12.00 — 25.00	21.13	20.68
G64	25.00	2.00	12.00 — 25.00	26.77	26.40
G65	25.00	2.00	12.00 — 25.00	39.20	41.15
G66	70.00	2.00	45.00 — 65.00	235.81	235.81
G67	40.00	2.00	25.00 — 40.00	251.51	251.51
G68	40.00	2.00	15.00 — 40.00	252.07	252.07
M14	48.90	2.00	8.90 — 48.90	318.39	318.39
M15	93.00	2.00	63.00 — 93.00	243.61	243.61
M16	66.00	2.00	26.00 — 66.00	302.23	302.23
M17	100.00	2.00	44.00 — 74.00	208.02	208.02
M18	74.00	2.00	44.00 — 74.00	139.74	139.74
M19	100.00	2.00	55.00 — 100.00	295.96	295.96
M20	100.00	2.00	69.00 — 100.00	200.00	226.67
M21	72.00	2.00	32.00 — 72.00	360.85	360.85
M22	71.00	2.00	31.00 — 71.00	358.74	358.74
M23	142.00	2.00	112.00 — 142.00	330.34	330.34
M24	71.00	2.00	41.00 — 71.00	330.94	330.94
RW2	30.00	8.00	5.00 — 30.00	198.30	197.91

(1) Measurements based on mean sea level.

Table 3
Monthly Skimmer Summary, DFSP-Ozol

Skimmer Well Number	Date	Amount of Product Bailed (milliliters)	Depth to Water	Depth to Product	Comments
02A	1-26-01	0	15.85		Adjusted skimmer
02A	2-23-01	0	12.33		
02A	3-23-01	0	14.62		Adjusted skimmer
02A	4-20-01	0	14.82		
02A	5-24-01	0	14.43		Adjusted skimmer
02A	6-25-01	0	15.80		
4	1-26-01	0	11.72		No skimmer
4	2-23-01	0	9.07		
4	3-23-01	0	8.61		
4	4-20-01	0	9.22		
4	5-24-01	0	10.30		
4	6-25-01	0	11.25		
6B	1-26-01	<40	11.65	11.51	Skimmer
[illegible]	2-23-01	0	10.83		
[illegible]	3-23-01	40	12.05	11.95	
6B	4-20-01	<40	2.73	2.70	
6B	5-24-01	100	6.75	6.61	Bright yellow product
6B	6-25-01	40	4.07	3.92	Yellow product
M11	1-26-01	0	8.95		No skimmer
M11	2-23-01	0	7.49		
M11	3-23-01	0	10.10		
M11	4-20-01	0	10.40		
M11	5-24-01	0	11.50		
M11	6-25-01	0	12.60		
M15	1-26-01	0	65.90		Adjusted skimmer
M15	2-23-01	0	55.77		
M15	3-23-01	0	62.35	62.23	Adjusted skimmer
M15	4-20-01	0	64.85		
M15	5-24-01	70	65.63	65.61	Black product
[illegible]	6-25-01	<40	67.43		Black product
M21	1-26-01	<40	45.27		Skimmer

Table 3 (continued)
Monthly Skimmer Summary, DFSP-Ozol

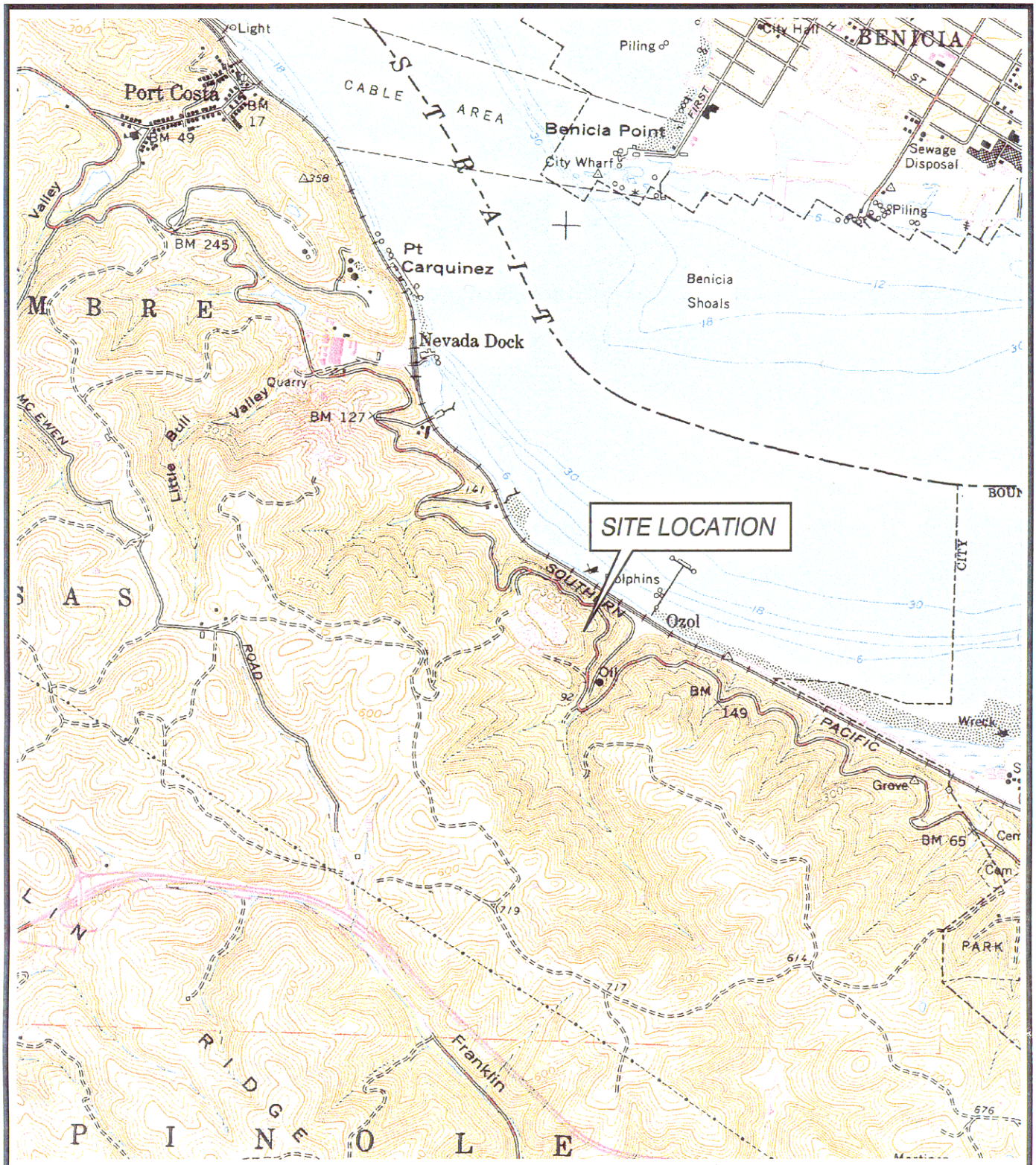
Skimmer Number	Date	Amount of Product Bailed (milliliters)	Depth to Water	Depth to Product	Comments
M21	2-23-01	0	44.10		
M21	3-23-01	0	42.23		Adjusted skimmer
M21	4-20-01	<40	42.63	43.61	Yellow product
M21	5-24-01	50	43.10	43.09	Black product
M21	6-25-01	<40	43.54		Black product
M22	1-26-01	<40	43.10	43.05	Skimmer
M22	2-23-01	0	42.44		
M22	3-23-01	0	40.07		Adjusted skimmer
M22	4-20-01	<40	40.33	40.30	Yellow product
M22	5-24-01	50	40.72	40.70	Bright yellow product
M22	6-25-01	<40	41.17	41.15	Yellow product
EA28	1-26-01	0	29.37		No skimmer
EA28	2-23-01	0	27.63		
EA28	3-23-01	0	25.76		
EA28	4-20-01	0	26.25		
EA[illegible]	5-24-01	0	26.88		
[illegible]	6-25-01	0	27.37		
EA31	1-26-01	0	19.16		No skimmer
EA31	2-23-01	0	17.70		
EA31	3-23-01	0	15.25		
EA31	4-20-01	0	14.64		
EA31	5-24-01	0	15.87		
EA31	6-25-01	0	17.91		
EA33	1-26-01	<5	88.27		Adjusted skimmer
EA33	2-23-01	0	88.26		
EA33	3-23-01	0	88.25		Adjusted skimmer
EA33	4-20-01	<40	87.37	87.39	Yellow product
EA33	5-24-01	<10	87.00	86.68	Bright yellow product
EA33	6-25-01	<40	87.14	87.12	Yellow product
EA36	1-26-01	<5	46.32	46.31	No skimmer
EA36	2-23-01	0	44.44		
EA36	3-23-01	0	42.50		
[illegible]	4-20-01	0	42.73		

Table 3 (continued)
Monthly Skimmer Summary, DFSP-Ozol

Skimmer Number	Date	Amount of Product Bailed (milliliters)	Depth to Water	Depth to Product	Comments
EA36	5-24-01	0	43.22		
EA36	6-25-01	0	43.75		
DM41	1-26-01	0	14.70		Adjusted skimmer
DM41	2-23-01	0	12.37		
DM41	3-23-01	0	14.21		Adjusted skimmer
DM41	4-20-01	0	14.62		
DM41	5-24-01	0	14.30		
DM41	6-25-01	0	13.52		
DM44	1-26-01	<40	45.74	45.72	Skimmer cable broken, yellow product
DM44	2-23-01	0	45.22		
DM44	3-23-01	<40	43.29		Re-deployed skimmer, yellow product
DM44	4-20-01	<40	43.15	43.13	Yellow product
DM44	5-24-01	50	43.73	43.72	Bright yellow product
DM44	6-25-01	0	44.05		
[redacted]	1-26-01	<40	27.50	27.49	Skimmer, yellow product
DM45	2-23-01	20	23.86		
DM45	3-23-01	0	18.36		Adjusted skimmer
DM45	4-20-01	0	19.20		
DM45	5-24-01	90	21.02	21.00	Bright yellow product
DM45	6-25-01	0	22.65		
DM46	1-26-01	0	43.64		Adjusted skimmer
DM46	2-23-01	0	33.80		
DM46	3-23-01	0	36.14		Adjusted skimmer
DM46	4-20-01	0	38.68		
DM46	5-24-01	20	40.60		Bright yellow product
DM46	6-25-01	0	42.10		
G56	1-26-01	0	13.89		No skimmer
G56	2-23-01	0	9.27		
G56	3-23-01	0	11.17		
G56	4-20-01	0	9.70		
G56	5-24-01	0	13.55		
[redacted]	6-25-01	0	14.90		

Table 3 (continued)
Monthly Skimmer Summary, DFSP-Ozol

Skimmer Number	Date	Amount of Product Bailed (milliliters)	Depth to Water	Depth to Product	Comments
G57	1-26-01	0	10.36		Pumping well
G57	2-23-01	0	5.95		
G57	3-23-01	0	8.00		
G57	4-20-01	0	6.01		
G57	5-24-01	0	10.30		
G57	6-25-01	0	11.40		
G68	1-26-01	0	9.70		Adjusted skimmer
G68	2-23-01	0	7.66		
G68	3-23-01	<40	7.30		Yellow product
G68	4-20-01	0	7.72		
G68	5-24-01	80	9.08	9.05	Bright yellow product
G68	6-25-01	0	10.80		



GROUNDWATER TECHNOLOGY, INC. A MEMBER OF THE IT GROUP SOURCE: U.S.G.S. 7.5' QUAD SHEET BENICIA, CALIFORNIA PHOTOREVISED 1979	N	SCALE: 0 FEET 2000	SITE LOCATION MAP
		CLIENT: DEFENSE ENERGY SUPPORT CENTER DESC OZOL	DATE: 1/21/99
		LOCATION: 700 CARQUINEZ SCENIC DR. MARTINEZ, CALIFORNIA	FIGURE: 1

IMAGE	X-REF	OFFICE	DRAWN BY	CHECKED BY	APPROVED BY	DRAWING NUMBER
	---	Concord	SJZ 11/30/01			832304-B2

CARQUINEZ STRAIT

PIER

LEGEND
- MONITORING WELL
- EXTRACTION WELL
- TC TREATMENT COMPOUND

EA38 M17 DM48 DM49 EA30 EA25 01 10 M16 EA27 EA37 DM43 C8 C2A C2B G67 G68 DM45 T836 T837 EA36 T838 M22 DM44 T8310 UPPER TANK AREA T839 M21 T8312 T834 M23 M24 T8311 07 EA33 T835 DM46 T833 LOWER TANK AREA T832 DM47 EA29 T831 EA31 M14 POND B SPRING NO. 2 SPRING NO. 3 SPRING NO. 1 PIPES EA34 03 04 13 TC12 05 M20 M15 G66 09 RW1 06B RW2 G51 G50 DM41 DM42 EA35 EA26 M18 OFFICE GENERATOR BUILDING G53 TC TANK TRUCK LOADING AREA DM39 G63 G64 G62 DM40 G61 G60 G57 G56 G58 G54 G55 G59 G52 G65

CARQUINEZ SCENIC DRIVE

N

SCALE
0 200 400FEET

GROUNDWATER TECHNOLOGY, INC. A MEMBER OF THE IT GROUP	DEFENSE ENERGY SUPPORT CENTER DFSC OZOL 700 CARQUINEZ SCENIC DR. MARTINEZ, CALIFORNIA

FIGURE 2

SITE PLAN

Table 1
Well Sampling Schedule

Well	Semiannual May	Semiannual October
01	X	X
02A	X	X
02B	X	X
03	X	
04	X	X
05	X	
06B	X	X
07	X	X
08	X	X
09	X	X
11	X	X
DM39	X	X
DM40	X	X
DM41	X	X
DM42	X	
DM43	X	
DM44	X	X
DM45	X	X
DM46	X	X
DM47	X	X
DM48	X	X
DM49	X	X
EA25	X	X
EA26	X	X
EA27	X	X
EA28	X	X
EA29	X	X
EA30	X	
EA31	X	X
EA33	X	X
EA34	X	X
EA35	X	X
EA36	X	X
EA37	X	
EA38	X	X
G50	X	X
G51	X	X
G52	X	X
G53	X	X
G54	X	X
G55	X	X
G56	X	X
G57	X	X
G58	X	X

Table 1
Well Sampling Schedule
(continued)

Well	Semiannual May	Semiannual October
G59	X	X
G60	X	X
G61	X	X
G62	X	X
G63	X	X
G64	X	X
G65	X	X
G66	X	X
G67	X	X
G68	X	X
M14	X	X
M15	X	X
M16	X	X
M17	X	X
M18	X	X
M19	X	X
M20	X	
M21	X	X
M22	X	X
M23	X	
M24	X	
RW2	X	X

Table 2
Well Construction Details

Site	Completion Depth (feet bgs)	Casing Diameter (inches)	Screened Interval (feet bgs)		Ground Surface Elevation [1]	Measuring Point Elevation [1] (feet)
			Top	Bottom		
01	43.70	2.00	24.70	43.70	303.80	303.80
02A	34.70	2.00	9.70	34.70	251.99	251.99
02B	39.90	2.00	29.90	39.90	251.06	251.06
03	39.90	2.00	9.90	39.90	272.32	272.32
04	22.60	2.00	5.60	22.60	252.37	252.37
05	17.40	2.00	7.40	17.40	233.92	233.92
06B	22.60	2.00	5.60	22.60	235.20	235.20
07	61.60	2.00	26.60	61.60	321.10	321.10
08	41.50	2.00	21.50	41.50	295.58	295.58
09	50.00	2.00	30.00	50.00	220.97	220.97
11	30.00	2.00	10.00	30.00	178.90	178.90
DM39	18.50	4.00	3.00	18.00	19.33	22.21
DM40	21.50	4.00	6.00	21.00	22.20	25.04
DM41	28.30	4.00	20.00	28.00	116.95	116.39
DM42	28.50	4.00	14.50	28.00	93.69	96.28
DM43	138.50	4.00	118.00	138.00	289.23	291.67
DM44	53.50	4.00	48.00	53.00	358.16	360.69
DM45	43.50	4.00	38.00	43.00	295.95	297.92
DM46	44.50	4.00	30.00	44.50	336.54	338.90
DM47	133.50	4.00	103.00	133.00	324.39	327.19
DM48	70.00	4.00	59.50	69.50	206.53	212.37
DM49	35.50	4.00	20.00	35.00	167.72	170.23
EA25	101.00	5.00	40.00	101.00	300.75	300.75
EA26	35.00	5.00	4.00	35.00	141.26	141.26
EA27	96.00	5.00	65.00	96.00	337.00	338.00
EA28	82.00	5.00	25.00	82.00	296.94	296.94
EA29	100.00	5.00	20.00	100.00	287.36	287.36
EA30	50.00	5.00	10.00	50.00	167.25	167.25
EA31	65.00	5.00	20.00	65.00	290.53	290.53
EA33	87.00	5.00	51.00	87.00	317.56	317.56
EA34	80.00	5.00	5.00	80.00	256.20	256.20
EA35	35.00	5.00	5.00	35.00	54.84	54.48
EA36	70.00	5.00	33.00	70.00	361.51	361.51
EA37	55.00	5.00	17.00	55.00	184.87	187.87
EA38	79.00	5.00	29.00	79.00	202.40	202.40
G50	20.00	2.00	5.00	20.00	194.50	196.91
G51	20.00	2.00	5.00	20.00	203.00	205.35
G52	25.00	2.00	5.00	25.00	41.78	41.78
G53	24.80	2.00	4.80	24.80	40.94	40.70
G54	29.80	2.00	9.80	29.80	40.65	40.04
G55	25.00	2.00	12.00	25.00	34.02	33.68

Table 2
Well Construction Details
(continued)

G56	25.00	2.00	5.00 — 25.00	31.13	30.75
G57	40.00	6.00	10.00 — 40.00	28.44	27.02
G58	19.80	2.00	4.80 — 19.80	26.39	25.92
G59	32.00	2.00	14.00 — 32.00	31.60	33.72
G60	25.00	2.00	12.00 — 25.00	23.68	23.12
G61	20.00	2.00	5.00 — 32.00	19.74	19.51
G62	30.00	2.00	15.00 — 30.00	27.21	26.56
G63	25.00	2.00	12.00 — 25.00	21.13	20.68
G64	25.00	2.00	12.00 — 25.00	26.77	26.40
G65	25.00	2.00	12.00 — 25.00	39.20	41.15
G66	70.00	2.00	45.00 — 65.00	235.81	235.81
G67	40.00	2.00	25.00 — 40.00	251.51	251.51
G68	40.00	2.00	15.00 — 40.00	252.07	252.07
M14	48.90	2.00	8.90 — 48.90	318.39	318.39
M15	93.00	2.00	63.00 — 93.00	243.61	243.61
M16	66.00	2.00	26.00 — 66.00	302.23	302.23
M17	100.00	2.00	44.00 — 74.00	208.02	208.02
M18	74.00	2.00	44.00 — 74.00	139.74	139.74
M19	100.00	2.00	55.00 — 100.00	295.96	295.96
M20	100.00	2.00	69.00 — 100.00	200.00	226.67
M21	72.00	2.00	32.00 — 72.00	360.85	360.85
M22	71.00	2.00	31.00 — 71.00	358.74	358.74
M23	142.00	2.00	112.00 — 142.00	330.34	330.34
M24	71.00	2.00	41.00 — 71.00	330.94	330.94
RW2	30.00	8.00	5.00 — 30.00	198.30	197.91

(1) Measurements based on mean sea level.

Table 3
Monthly Skimmer Summary, DFSP-Ozol

Skimmer Well Number	Date	Amount of Product Bailed (milliliters)	Depth to Water	Depth to Product	Comments
02A	1-26-01	0	15.85		Adjusted skimmer
02A	2-23-01	0	12.33		
02A	3-23-01	0	14.62		Adjusted skimmer
02A	4-20-01	0	14.82		
02A	5-24-01	0	14.43		Adjusted skimmer
02A	6-25-01	0	15.80		
4	1-26-01	0	11.72		No skimmer
4	2-23-01	0	9.07		
4	3-23-01	0	8.61		
4	4-20-01	0	9.22		
4	5-24-01	0	10.30		
4	6-25-01	0	11.25		
6B	1-26-01	<40	11.65	11.51	Skimmer
[illegible]	2-23-01	0	10.83		
[illegible]	3-23-01	40	12.05	11.95	
6B	4-20-01	<40	2.73	2.70	
6B	5-24-01	100	6.75	6.61	Bright yellow product
6B	6-25-01	40	4.07	3.92	Yellow product
M11	1-26-01	0	8.95		No skimmer
M11	2-23-01	0	7.49		
M11	3-23-01	0	10.10		
M11	4-20-01	0	10.40		
M11	5-24-01	0	11.50		
M11	6-25-01	0	12.60		
M15	1-26-01	0	65.90		Adjusted skimmer
M15	2-23-01	0	55.77		
M15	3-23-01	0	62.35	62.23	Adjusted skimmer
M15	4-20-01	0	64.85		
M15	5-24-01	70	65.63	65.61	Black product
[illegible]	6-25-01	<40	67.43		Black product
M21	1-26-01	<40	45.27		Skimmer

Table 3 (continued)
Monthly Skimmer Summary, DFSP-Ozol

Skimmer Number	Date	Amount of Product Bailed (milliliters)	Depth to Water	Depth to Product	Comments
M21	2-23-01	0	44.10		
M21	3-23-01	0	42.23		Adjusted skimmer
M21	4-20-01	<40	42.63	43.61	Yellow product
M21	5-24-01	50	43.10	43.09	Black product
M21	6-25-01	<40	43.54		Black product
M22	1-26-01	<40	43.10	43.05	Skimmer
M22	2-23-01	0	42.44		
M22	3-23-01	0	40.07		Adjusted skimmer
M22	4-20-01	<40	40.33	40.30	Yellow product
M22	5-24-01	50	40.72	40.70	Bright yellow product
M22	6-25-01	<40	41.17	41.15	Yellow product
EA28	1-26-01	0	29.37		No skimmer
EA28	2-23-01	0	27.63		
EA28	3-23-01	0	25.76		
EA28	4-20-01	0	26.25		
EA[illegible]	5-24-01	0	26.88		
[illegible]	6-25-01	0	27.37		
EA31	1-26-01	0	19.16		No skimmer
EA31	2-23-01	0	17.70		
EA31	3-23-01	0	15.25		
EA31	4-20-01	0	14.64		
EA31	5-24-01	0	15.87		
EA31	6-25-01	0	17.91		
EA33	1-26-01	<5	88.27		Adjusted skimmer
EA33	2-23-01	0	88.26		
EA33	3-23-01	0	88.25		Adjusted skimmer
EA33	4-20-01	<40	87.37	87.39	Yellow product
EA33	5-24-01	<10	87.00	86.68	Bright yellow product
EA33	6-25-01	<40	87.14	87.12	Yellow product
EA36	1-26-01	<5	46.32	46.31	No skimmer
EA36	2-23-01	0	44.44		
EA36	3-23-01	0	42.50		
[illegible]	4-20-01	0	42.73		

Table 3 (continued)
Monthly Skimmer Summary, DFSP-Ozol

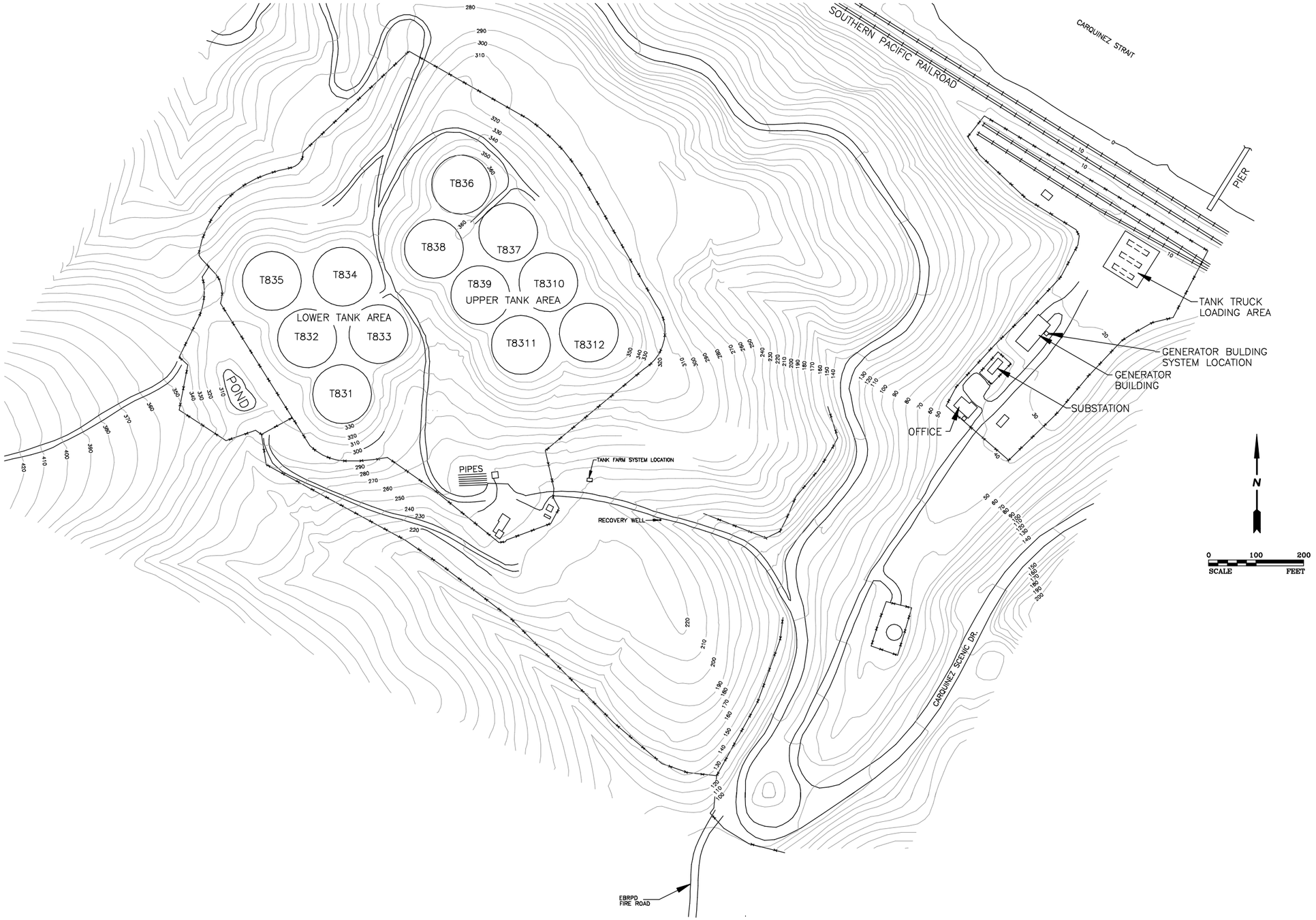
Skimmer Number	Date	Amount of Product Bailed (milliliters)	Depth to Water	Depth to Product	Comments
EA36	5-24-01	0	43.22		
EA36	6-25-01	0	43.75		
DM41	1-26-01	0	14.70		Adjusted skimmer
DM41	2-23-01	0	12.37		
DM41	3-23-01	0	14.21		Adjusted skimmer
DM41	4-20-01	0	14.62		
DM41	5-24-01	0	14.30		
DM41	6-25-01	0	13.52		
DM44	1-26-01	<40	45.74	45.72	Skimmer cable broken, yellow product
DM44	2-23-01	0	45.22		
DM44	3-23-01	<40	43.29		Re-deployed skimmer, yellow product
DM44	4-20-01	<40	43.15	43.13	Yellow product
DM44	5-24-01	50	43.73	43.72	Bright yellow product
DM44	6-25-01	0	44.05		
[redacted]	1-26-01	<40	27.50	27.49	Skimmer, yellow product
DM45	2-23-01	20	23.86		
DM45	3-23-01	0	18.36		Adjusted skimmer
DM45	4-20-01	0	19.20		
DM45	5-24-01	90	21.02	21.00	Bright yellow product
DM45	6-25-01	0	22.65		
DM46	1-26-01	0	43.64		Adjusted skimmer
DM46	2-23-01	0	33.80		
DM46	3-23-01	0	36.14		Adjusted skimmer
DM46	4-20-01	0	38.68		
DM46	5-24-01	20	40.60		Bright yellow product
DM46	6-25-01	0	42.10		
G56	1-26-01	0	13.89		No skimmer
G56	2-23-01	0	9.27		
G56	3-23-01	0	11.17		
G56	4-20-01	0	9.70		
G56	5-24-01	0	13.55		
[redacted]	6-25-01	0	14.90		

Table 3 (continued)
Monthly Skimmer Summary, DFSP-Ozol

Skimmer Number	Date	Amount of Product Bailed (milliliters)	Depth to Water	Depth to Product	Comments
G57	1-26-01	0	10.36		Pumping well
G57	2-23-01	0	5.95		
G57	3-23-01	0	8.00		
G57	4-20-01	0	6.01		
G57	5-24-01	0	10.30		
G57	6-25-01	0	11.40		
G68	1-26-01	0	9.70		Adjusted skimmer
G68	2-23-01	0	7.66		
G68	3-23-01	<40	7.30		Yellow product
G68	4-20-01	0	7.72		
G68	5-24-01	80	9.08	9.05	Bright yellow product
G68	6-25-01	0	10.80		

APPENDIX B-2

TFGRS AND GBSRS SYSTEM DRAWINGS



LEGEND

PROPERTY LINE FENCING

EBRPD EAST BAY REGIONAL PARK DISTRICT

NO.	DATE	BY	REVISION PURPOSE
4	2/21/02	JT	ADDED GBSRS
3	10/15/96	JT	AS-BUILT
2	1/16/96	JT	ISSUED FOR CONSTRUCTION
1	5/16/95	RAK	90% DESIGN SUBMITTAL
0	2NOV94	JT	30% DESIGN SUBMITTAL

INTERNATIONAL TECHNOLOGY CORPORATION

DEFENSE ENERGY SUPPLY CENTER DFSP OZOL

700 CARQUINEZ SCENIC DR.
MARTINEZ, CALIFORNIA

SITE PLAN

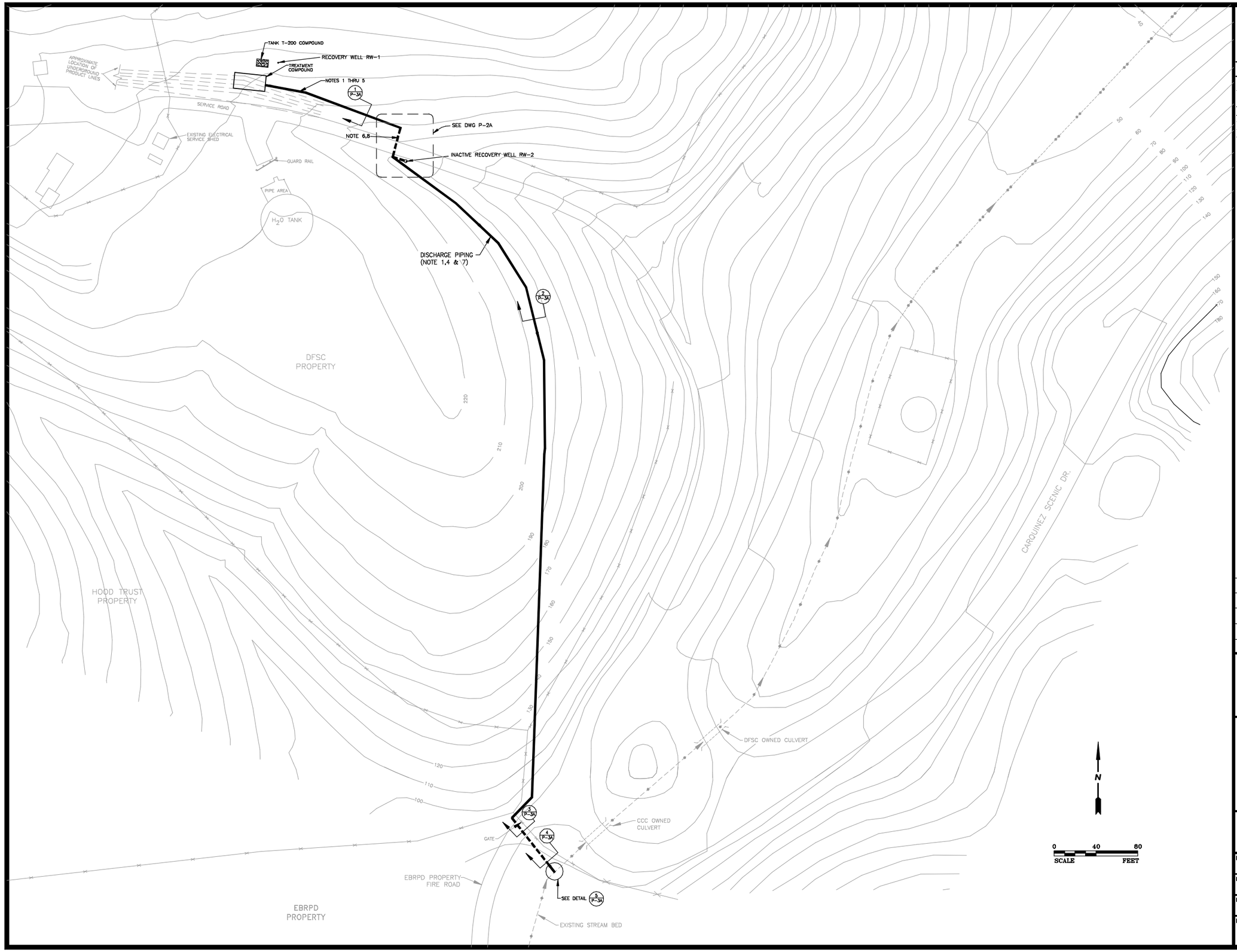
DESIGNED BY:	DRAWN BY:	CHECKED BY:
GREG SCOTT	ML	J.TOLSKIE,P.E.

DATE:	FILE:
2NOV94	A-1_4

PROJECT NO.:	CONTRACT:
830011194	

DRAWING: A-1

REVISION: - 4



LEGEND

- PROPOSED TREATMENT SYSTEM DISCHARGE PIPING (ABOVE GROUND)
- PROPOSED TREATMENT SYSTEM DISCHARGE PIPING (UNDER GROUND)
- 80 — TOPOGRAPHIC CONTOUR LINE (FEET ABOVE MEAN SEA LEVEL)
- NATURAL STREAM CHANNELS
- EXISTING UNDERGROUND STORM DRAIN
- EXISTING ROAD CULVERT PIPE
- PROPERTY LINE FENCING
- EBRPD EAST BAY REGIONAL PARK DISTRICT
- CCC CONTRA COSTA COUNTY

NOTES:

1. PIPING SUPPORTS SPACED AT 5ft INTERVALS ALONG PIPING. SUPPORT PIPING TO ALLOW MOVEMENT AXIALLY.
2. WATER CONVEYANCE PIPING FROM THE RECOVERY WELL TO THE TREATMENT COMPOUND TO BE 2in SCH 40 CPVC WITH SECONDARY CONTAINMENT. SECONDARY CONTAINMENT TO BE 4in SCH 40 GALVANIZED CARBON STEEL WITH GALVANIZED THREADED MALLEABLE IRON FITTINGS.
3. RECOVERED PRODUCT CONVEYANCE PIPING FROM THE RECOVERY WELL TO THE TREATMENT COMPOUND TO BE 0.50in HYDROCARBON RESISTANT HOSE WITH SECONDARY CONTAINMENT. SECONDARY CONTAINMENT TO BE 2in SCH 40 GALVANIZED CARBON STEEL WITH GALVANIZED THREADED MALLEABLE IRON FITTINGS.
4. TREATED WATER DISCHARGE PIPING FROM THE TREATMENT COMPOUND TO THE NPDES DISCHARGE LOCATION TO BE CONSTRUCTED OF 2in SCH 80 PVC WITH NO SECONDARY CONTAINMENT. PVC PIPING TO BE PAINTED WITH EXTERIOR WATER BASE PAINT FOR PROTECTION FROM ULTRAVIOLET OXIDATION.
5. DRAWING INDICATES SINGLE PIPING HEADER, ACTUALLY THERE ARE THREE HEADERS (CONTAMINATED WATER, TREATED WATER, AND PRODUCT) AND ELECTRICAL CONDUITS (POWER & CONTROL).
6. THE THREE HEADERS (CONTAMINATED WATER, TREATED WATER, AND PRODUCT) AND CONDUIT DISCUSSED IN NOTE 5 ARE INDICATED AS ONE DOTTED LINE TO SHOW PIPING/CONDUIT BURIED IN TRENCH.
7. DRAWING INDICATES SINGLE PIPING HEADER, AND THERE IS ONLY ONE HEADER HERE FOR TREATED WATER.
8. INTERCEPTOR TRENCH NOT INSTALLED DUE TO LOCATION OF FUEL LINES.

NO.	DATE	BY	REVISION PURPOSE
3	2/19/02	JT	ADDED RW-1
2	10/15/96	JT	AS-BUILT
1	1/18/96	JT	ISSUED FOR CONSTRUCTION
0	5/5/95	RAK	90% DESIGN SUBMITTAL

INTERNATIONAL TECHNOLOGY CORPORATION

DEFENSE FUEL SUPPLY CENTER DFSP OZOL

700 CARQUINEZ SCENIC DR.
MARTINEZ, CALIFORNIA

PIPING PLAN TFGRS

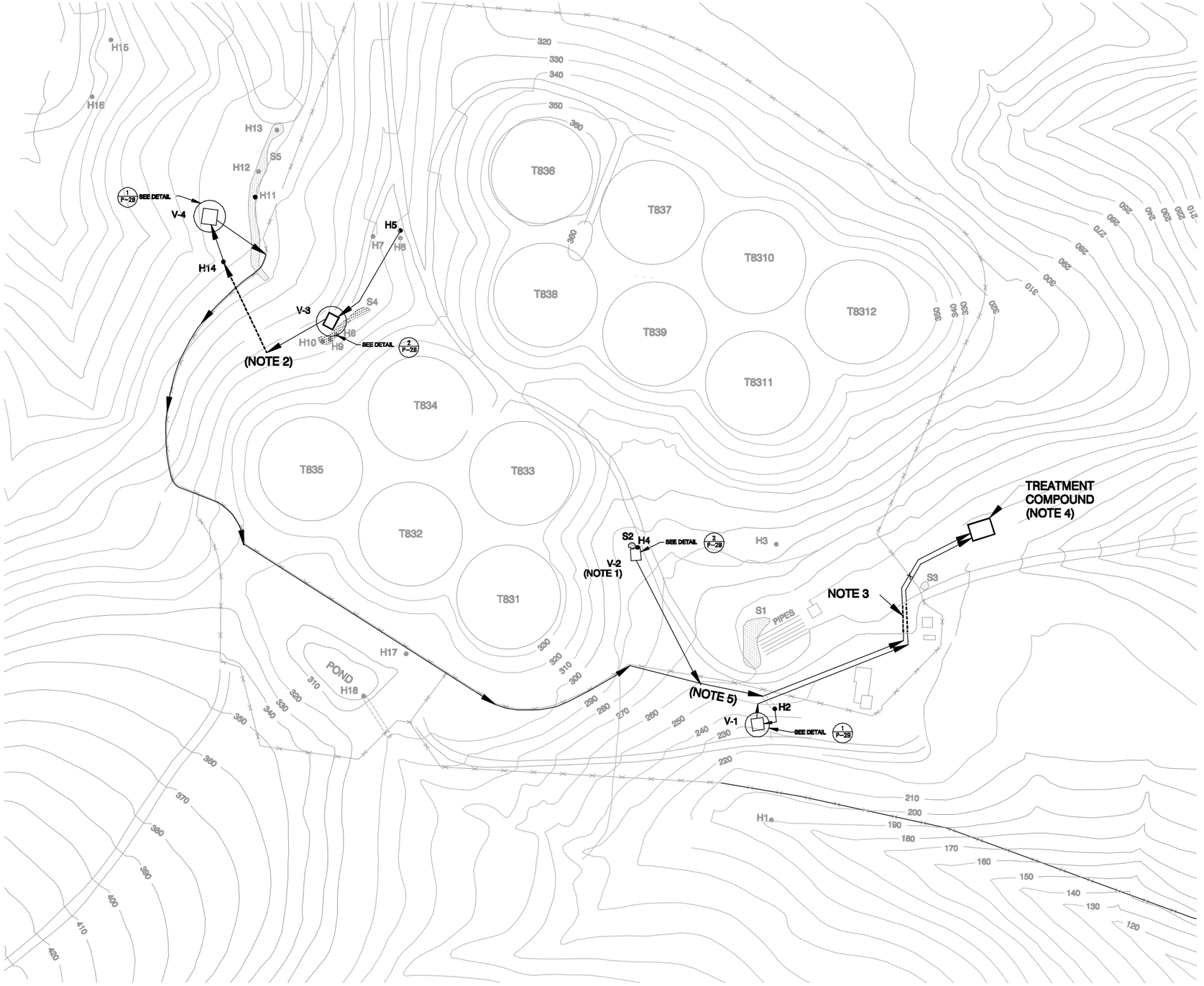
DESIGNED BY:	DRAWN BY:	CHECKED BY:
M. BRUNNER, PE	ML	R.A. KATIN, PE

DATE:	FILE:
5/5/95	P-1A_3

PROJECT NO.:	CONTRACT:
830011194	

DRAWING: P-1A

REVISION: - 3



LEGEND

- H18 ● HYDRAUGER
- S5 SEEP
- V-4 □ COLLECTION SUMP (NOT SHOWN TO SCALE)
- ABOVEGROUND PIPING
- BELOWGROUND PIPING
- FENCE

NOTES:

1. COLLECTION SUMP V-2 DRAINS TO V-1 BY WAY OF A 12in DIA STEEL CULVERT LABELED H-2 AT V-1.
2. COLLECTION SUMP V-3 DRAINS TO V-4 BY WAY OF A 12in DIA STEEL CULVERT LABELED H-14 AT V-4.
3. RUN CONTAMINATED GROUNDWATER CONVEYANCE PIPING THROUGH CULVERT UNDER ACCESS ROAD.
4. V-5, T-100, T-105, & T-200 ARE ALL LOCATED AT TREATMENT COMPOUND.
5. CONTAMINATED GROUND WATER CONVEYANCE PIPING SHALL BE SCH. 80 PVC.

NO.	DATE	BY	REVISION PURPOSE
4	2/19/02	JT	REROUTED PIPING
3	10/15/96	JT	AS-BUILT
2	1/18/96	JT	ISSUED FOR CONSTRUCTION
1	5/17/95	RAK	90% DESIGN SUBMITTAL
0	2/21/95	RAK	30% DESIGN SUBMITTAL

INTERNATIONAL TECHNOLOGY CORPORATION

DEFENSE ENERGY SUPPLY CENTER DFSP OZOL

700 CARQUINEZ SCENIC DR.
MARTINEZ, CALIFORNIA

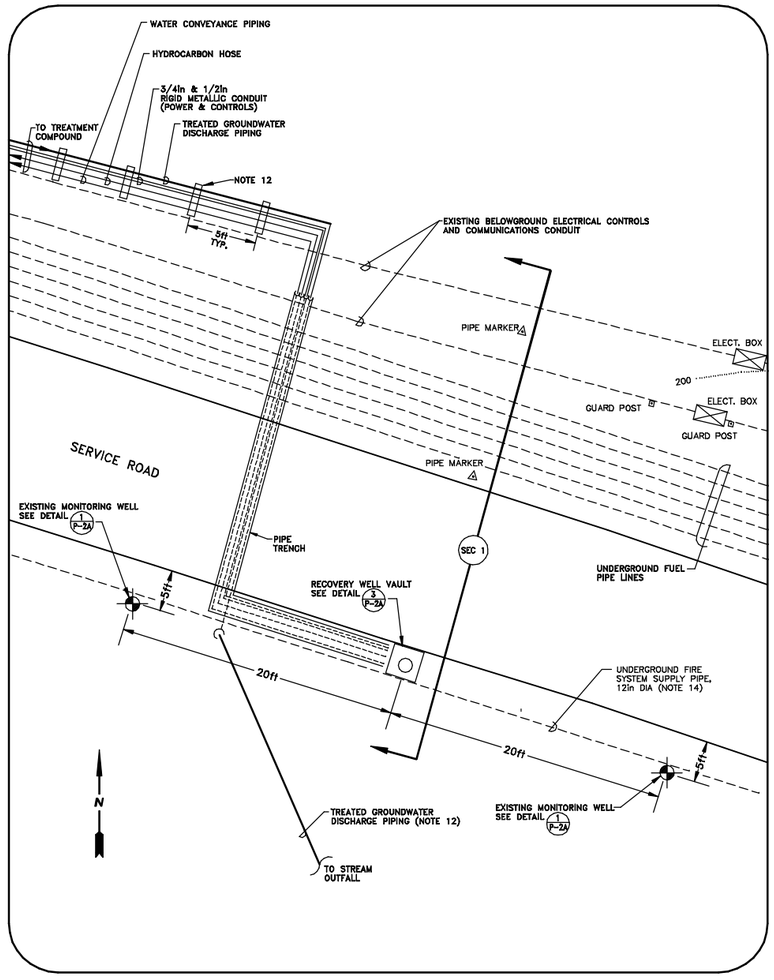
PIPING PLAN SEEP/HYDRAUGER COLLECTION SYSTEM

DESIGNED BY:	DRAWN BY:	CHECKED BY:
F. SEILER	ML	R.A. KATIN, PE

DATE:	FILE:
2/21/95	P-1B_4

PROJECT NO.:	CONTRACT:
830011194	

DRAWING: P-1B REVISION: - 4

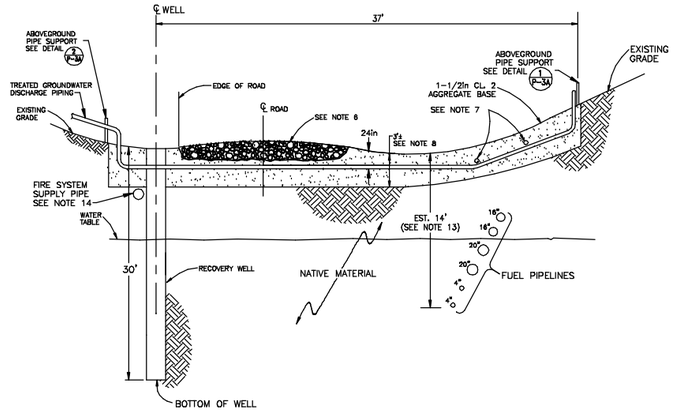


PLAN AT INTERCEPTOR TRENCH

SCALE: NONE

GENERAL NOTES:

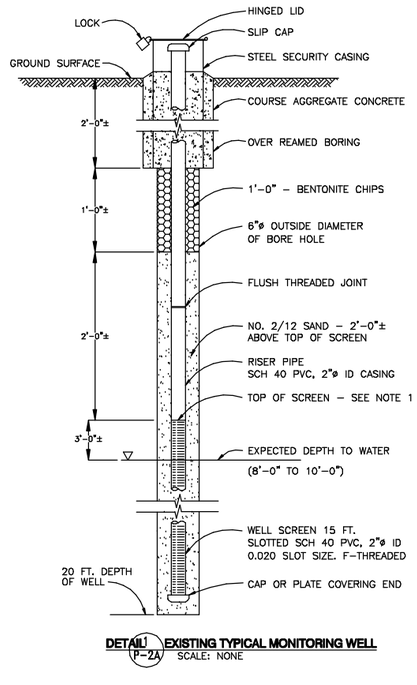
1. CUT-OFF WALL NOT INSTALLED DUE TO DEPTH AND CONFIGURATION OF FUEL PIPELINES. SEE SECTION 1.
2. (DELETED)
3. (DELETED)
4. (DELETED)
5. TEMPORARY USE OF ROAD MUST BE MAINTAINED DURING CONSRUCTION.
6. AFTER COMPLETION OF PIPE TRENCH, RESTORE ACCESS ROAD TO ORIGINAL CONDITION.
7. UG ELECTRIC, COMMUNICATIONS, AND CONTROLS (2 CONDUIT) LOCATIONS MUST BE VALIDATED.
8. MAY BE LESS THAN 3'-0" OVER FUEL PIPELINES IF 1'-0" COVER GOVERNS.
9. 1'-0" COVER IS TO EXTEND 3' BEYOND UNDERGROUND LINES.
10. (DELETED)
11. (DELETED)
12. PIPING SUPPORTS SPACED AT 5ft INTERVALS. PIPE FREE TO MOVE AXIALLY.
13. FUEL PIPELINES DEPTH AND CONFIGURATION ESTIMATED BY C.V. SURVEYS, MARCH 19, 1996.
14. FIRE SYSTEM SUPPLY PIPE IS 12 INCHES IN DIAMETER AND BURIED APPROXIMATELY 3 FEET BELOW GRADE.
15. PUMPS REMOVED FROM WELL.



SECTION 1

ELEVATION OF INTERCEPTOR TRENCH - NORTH SIDE

NOT TO SCALE

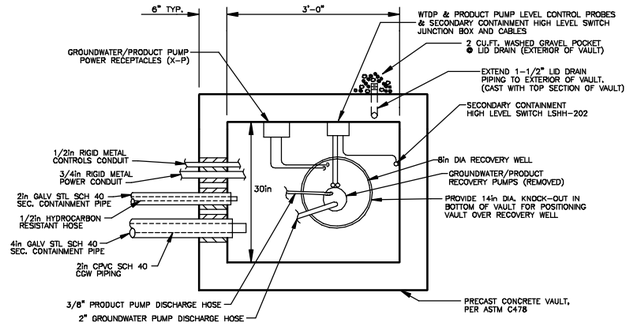


DETAIL 1 P-2A EXISTING TYPICAL MONITORING WELL

SCALE: NONE

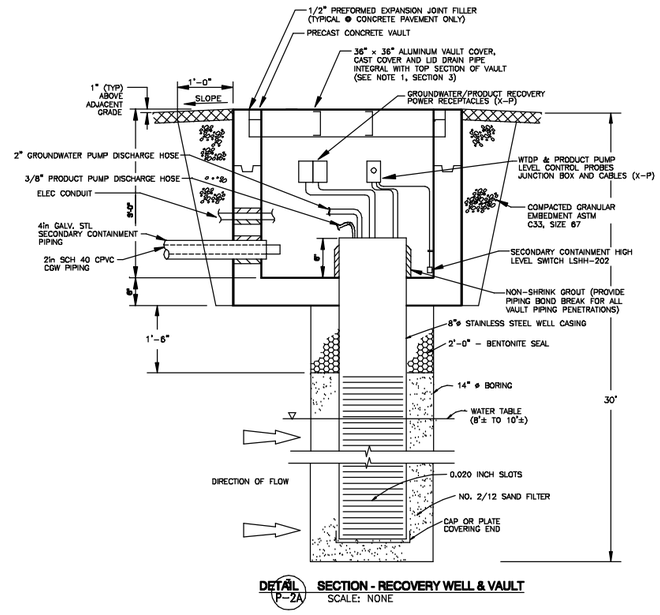
NOTE:

1. TOP OF WELL SCREEN SHOULD BE 2-4 FEET ABOVE STATIC WATER.
2. FIELD GEOLOGIST SHALL BE RESPONSIBLE FOR LOCATING THE SCREEN AND THE SAND FILTER WITHIN THE CAPILLARY AND SATURATED ZONE.



DETAIL 1 P-2A PLAN - RECOVERY WELL VAULT

SCALE: NONE



DETAIL 2 P-2A SECTION - RECOVERY WELL & VAULT

SCALE: NONE

NOTES:

1) FURNISH AND INSTALL H-20 RATED LID W/SPRING ASSIST (US FOUNDARY) FIELD ROUTE LID DRAIN PIPING TO WASHED GRAVEL POCKET ADJACENT TO VAULT.

LEGEND

CGW	CONTAMINATED GROUNDWATER
WTDP	WATER TABLE DEPRESSION PUMP
X-P	EXPLOSION PROOF (CLASS 1, DIV 1, GROUP D)

NO.	DATE	BY	REVISION PURPOSE
3	2/20/02	JT	PUMPS REMOVED
2	10/15/96	JT	AS-SUILT
1	1/18/96	JT	ISSUED FOR CONSTRUCTION
0	6/7/95	RAK	90% DESIGN

INTERNATIONAL TECHNOLOGY CORPORATION

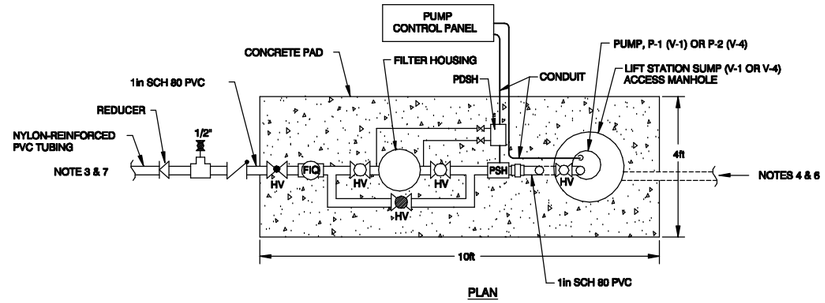
DEFENSE ENERGY SUPPLY CENTER DFSP OZOL

700 CARQUINEZ SCENIC DR.
MARTINEZ, CALIFORNIA

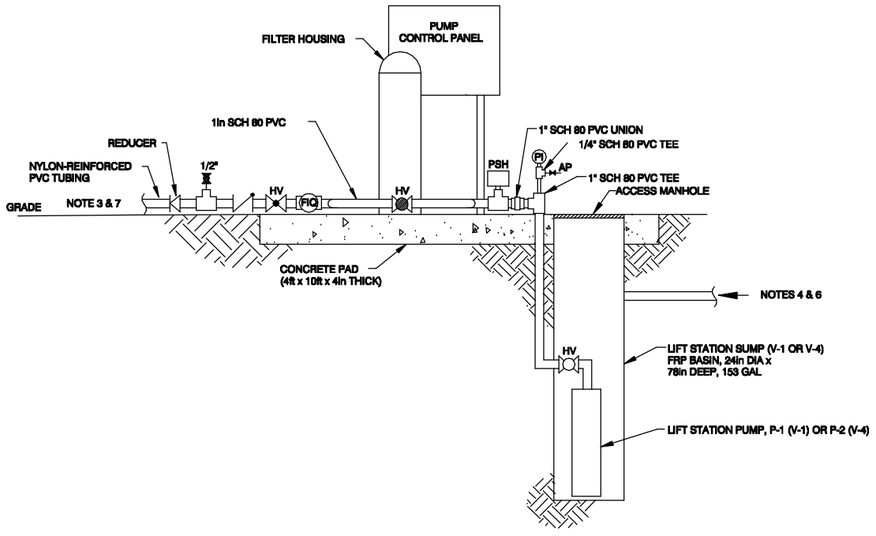
INTERCEPTOR TRENCH CONSTRUCTION DETAILS TFGRS

DESIGNED BY:	DRAWN BY:	CHECKED BY:
W.F. PETERS, PE	ML	ED WOOD, PE

DATE: 6/7/95	FILE: P-2A_3
PROJECT NO.: 830011194	CONTRACT:
DRAWING: P-2A	REVISION: - 3

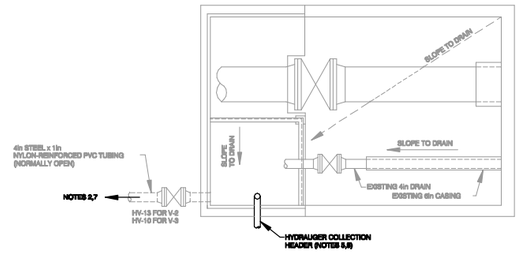


PLAN

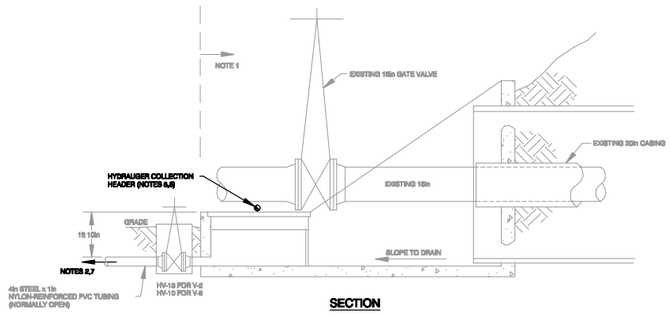


SECTION

DETAIL P-2B **V-1 & V-4 LIFT STATION SUMP**
SCALE: NONE (REFER TO DRAWING P-1B)

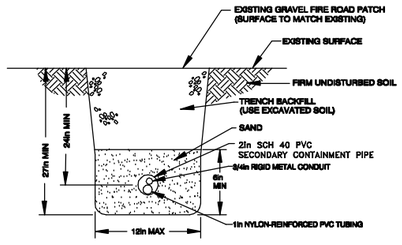


PLAN



SECTION

DETAIL P-2B **V-2 & V-3 RETAINING WALL/ CONTAINMENT SUMPS (NOTE 1)**
SCALE: NONE (REFER TO DRAWING P-1B)



3 P-2B **TRENCH SECTION**
SCALE: NONE (REFER TO DRAWING P-1B)

LEGEND

FIQ	FLOW INDICATING TOTALIZER
HV	HAND VALVE
NC	NORMALLY CLOSED
PI	PRESSURE INDICATOR

NOTES:

1. RETAINING WALL/CONTAINMENT SUMP DETAILS FOR V-2, V-3, & V-4 DESIGNED BY OTHERS. DRAWING DETAILS TAKEN FROM NAVFAC DWG. NO. 0388885, S-3.
   LIFT STATION SUMP (V-1) AND LIFT STATION PUMPS AT V-1 & V-4 DESIGNED BY GROUNDWATER TECHNOLOGY, INC. SEE DWG. P-1A.
2. RETAINING WALL/CONTAINMENT SUMP FOR V-2 TO GRAVITY DRAIN INTO V-1.
   RETAINING WALL/CONTAINMENT SUMP FOR V-3 TO GRAVITY DRAIN INTO V-4. SEE DWG. P-1B.
3. DISCHARGE FROM SUMP V-1 PUMPED TO V-5.
   DISCHARGE FROM SUMP V-4 PUMPED TO V-6.
4. AT V-1, A 4in SCH 40 PVC PIPE WILL CONNECT TO A 12in DIA STEEL CULVERT PIPE ABOVEGROUND AND GRAVITY DRAIN INTO THE LIFT STATION SUMP. SEE DWG. P-1B.
5. AT V-2, A 1in DIA NYLON-REINFORCED PVC HOSE CONNECTS BEEP 5-2 TO THE RETAINING WALL/ CONTAINMENT SUMP. H-4, A 6in DIA STEEL CULVERT PIPE, CONNECTS TO H-2, WHICH DRAINS TO V-1.
   AT V-3, A 1in DIA NYLON-REINFORCED PVC HOSE CONNECTS ONE EXISTING HYDRAUGER (H-5, A 6in DIA STEEL PIPE) ABOVEGROUND AND GRAVITY DRAINS INTO THE RETAINING WALL/CONTAINMENT SUMP. SEE DWG P-1B.
6. AT V-4, H-11, A 2in DIA STEEL PIPE IS CONNECTED BY A 1in DIA NYLON-REINFORCED PVC HOSE. A 4in DIA SCH 40 PVC PIPE CONNECTS EXISTING H-14, A 12in DIA STEEL CULVERT PIPE, TO V-4. SEE DWG. P-1B.
7. SEPARATE DISCHARGE HOSES (1in DIA NYLON-REINFORCED PVC TUBING) WHICH WILL LIE DIRECTLY ON GRADE, UNSUPPORTED, WILL CONNECT THE LIFT STATION PUMP DISCHARGE LINES AT V-1 & V-4 TO V-5.
8. THE HYDRAUGER COLLECTION HEADER WILL BE SUPPORTED ABOVEGROUND AS SHOWN IN DETAIL 2, DWG. P-5A ADJACENT TO THE RETAINING WALL/CONTAINMENT SUMP.

NO.	DATE	BY	REVISION PURPOSE
3	2/20/02	JT	CHANGE TITLE
2	10/15/98	JT	AS-BUILT
1	1/19/98	JT	ISSUED FOR CONSTRUCTION
0	6/12/95	RAK	FOR CLIENT REVIEW

INTERNATIONAL TECHNOLOGY CORPORATION

DEFENSE ENERGY SUPPLY CENTER DFSP OZOL

700 CARQUINEZ SCENIC DRIVE
MARTINEZ, CALIFORNIA

SUMP AND OFF-PAD PIPING CONSTRUCTION DETAILS TFGRS

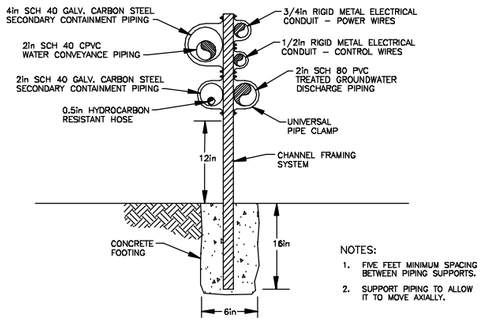
DESIGNED BY:	DRAWN BY:	CHECKED BY:
M. BRUNNER, PE	ML	R.A. KATIN, PE

DATE:	FILE:
6/12/95	P-2B_3

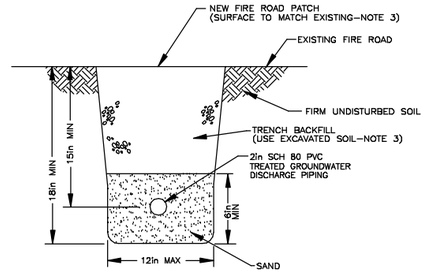
PROJECT NO.:	CONTRACT:
830011194	

DRAWING: P-2B

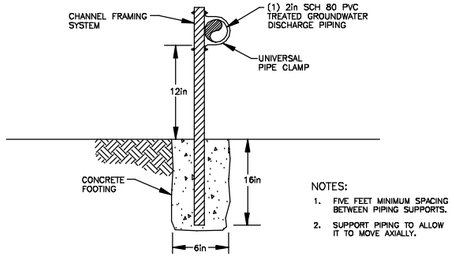
REVISION: - 3



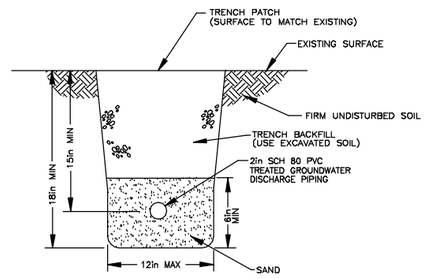
1 P-3A **PIPING SUPPORT DETAIL**
NOT TO SCALE
(REFER TO DRAWING P-1A)



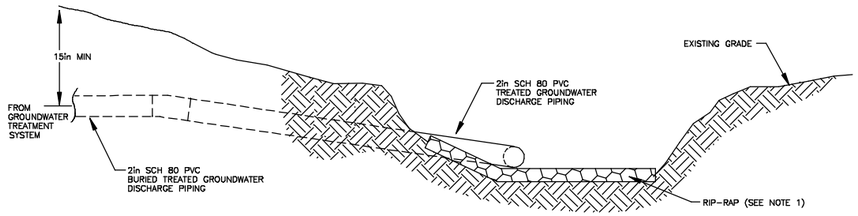
3 P-3A **TRENCH SECTION**
NOT TO SCALE
(REFER TO DRAWING P-1A)



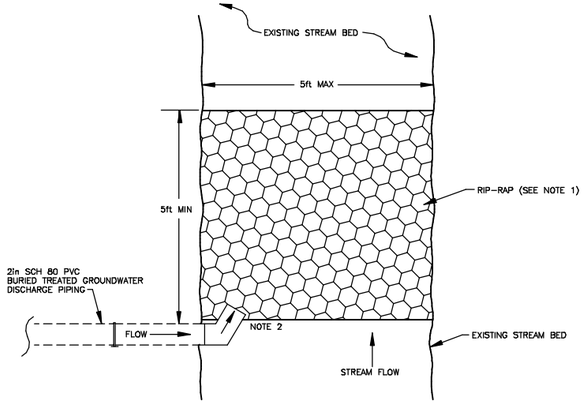
2 P-3A **PIPING SUPPORT DETAIL**
NOT TO SCALE
(REFER TO DRAWING P-1A)



4 P-3A **TRENCH SECTION**
NOT TO SCALE
(REFER TO DRAWING P-1A)



ELEVATION



PLAN VIEW

5 P-3A **STREAM CHANNEL DISCHARGE DETAIL**
NOT TO SCALE
(REFER TO DRAWING P-1A)

NOTES:

1. RIP–RAP MATERIAL INSTALLED AT A DISTANCE OF 5ft FROM THE OUTFALL LOCATION TO PREVENT EROSION OF THE STREAMBED.
2. OUTFALL OF TREATED GROUNDWATER KEPT AS CLOSE AS POSSIBLE TO SIDE OF THE STREAMBED AND ANGLED TO DISCHARGE WATER IN DIRECTION OF STREAM FLOW.
3. TRENCH BACKFILL SHALL CONFORM TO SECTION 19–3.06 OF CALTRANS STANDARD SPECIFICATIONS AND THE CURRENT EDITION OF THE STANDARD PLANS. TESTS FOR RELATIVE COMPACTION OF STRUCTURE BACKFILL MATERIAL USED IN BACKFILLING TRENCHES SHALL BE IN ACCORDANCE WITH CALIFORNIA TEST METHOD No. 231 (NUCLEAR GAUGE). ANY BASE, SURFACING OR PAVEMENT SHALL BE REPLACED IN KIND.

NO.	DATE	BY	REVISION PURPOSE
3	10/15/96	JT	CHANGED TITLE
2	10/15/96	JT	AS-BUILT
1	1/19/96	JT	ISSUED FOR CONSTRUCTION
0	5/19/95	RAK	90% DESIGN SUBMITTAL

INTERNATIONAL TECHNOLOGY CORPORATION

DEFENSE ENERGY SUPPLY CENTER DFSP OZOL

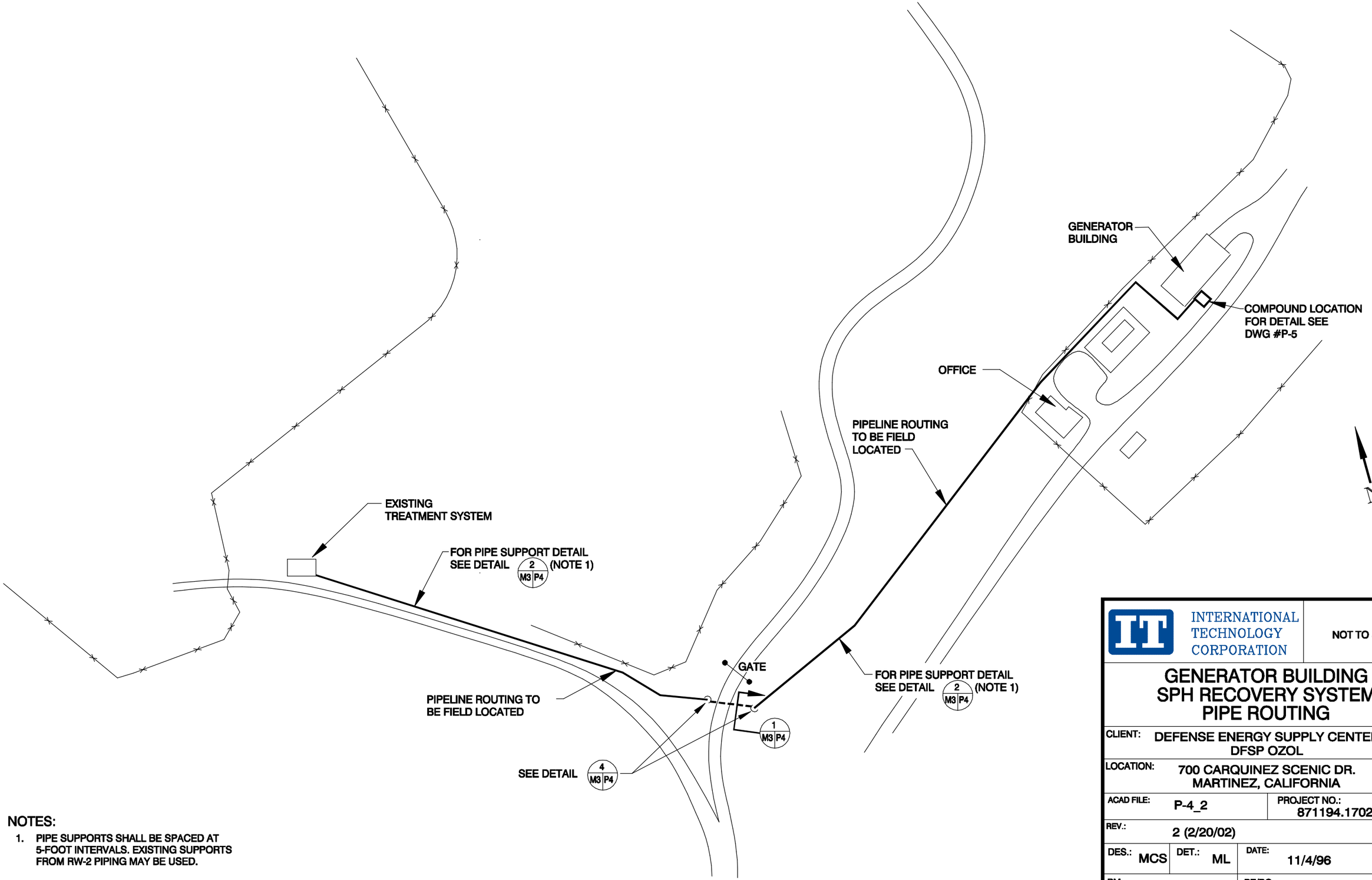
700 CARQUINEZ SCENIC DR.
MARTINEZ, CALIFORNIA

OFF-PAD PIPING CONSTRUCTION DETAILS TFGRS

DESIGNED BY:	DRAWN BY:	CHECKED BY:
M. BRUNNER, PE	ML	R.A. KATIN, PE

DATE:	FILE:
5/19/95	P3A
PROJECT NO.: 830011194	CONTRACT:

DRAWING: P-3A
REVISION: - 3



NOTES:

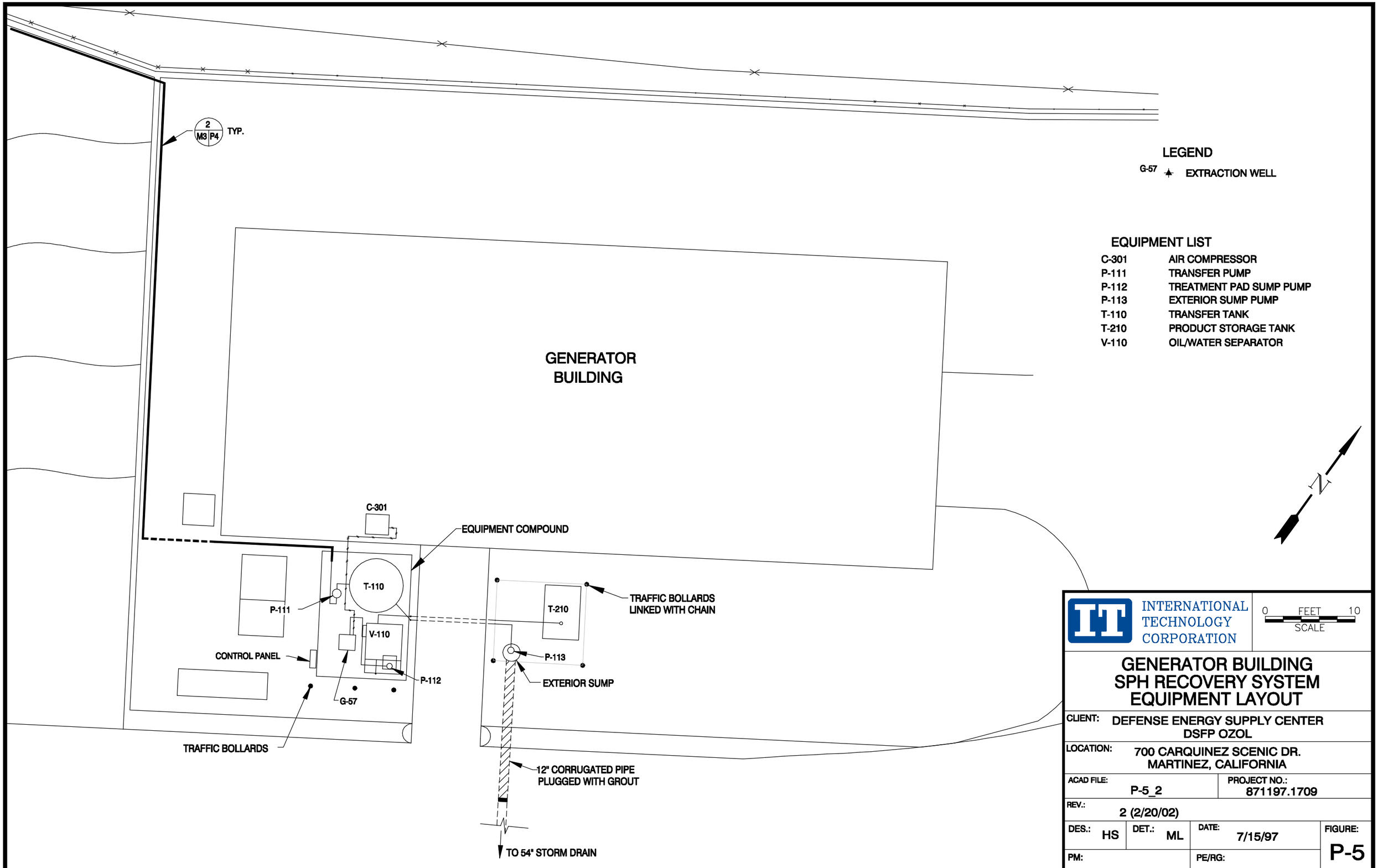
1. PIPE SUPPORTS SHALL BE SPACED AT 5-FOOT INTERVALS. EXISTING SUPPORTS FROM RW-2 PIPING MAY BE USED.

INTERNATIONAL TECHNOLOGY CORPORATION

NOT TO SCALE

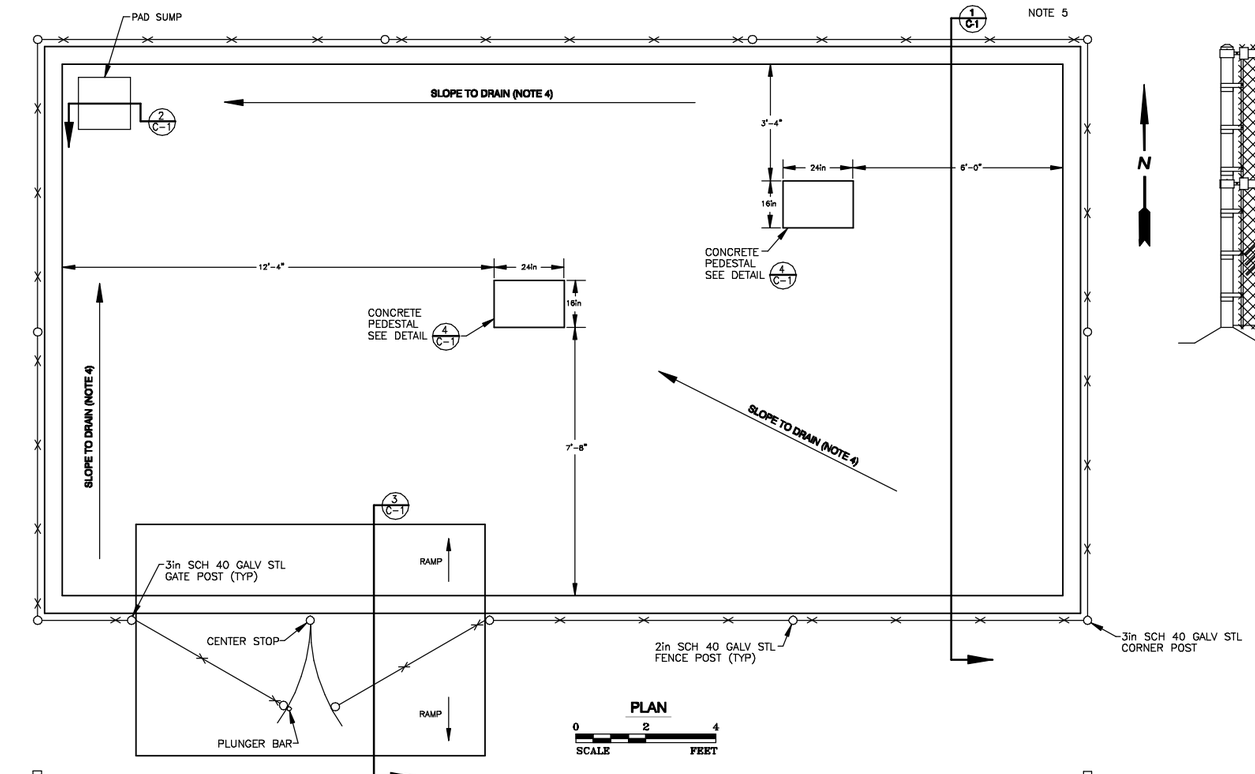
GENERATOR BUILDING SPH RECOVERY SYSTEM PIPE ROUTING

CLIENT:	DEFENSE ENERGY SUPPLY CENTER DFSP OZOL		
LOCATION:	700 CARQUINEZ SCENIC DR. MARTINEZ, CALIFORNIA		
ACAD FILE:	P-4_2	PROJECT NO.:	871194.1702
REV.:	2 (2/20/02)		
DES.: MCS	DET.: ML	DATE: 11/4/96	FIGURE: P-4
PM:		PE/RG:	



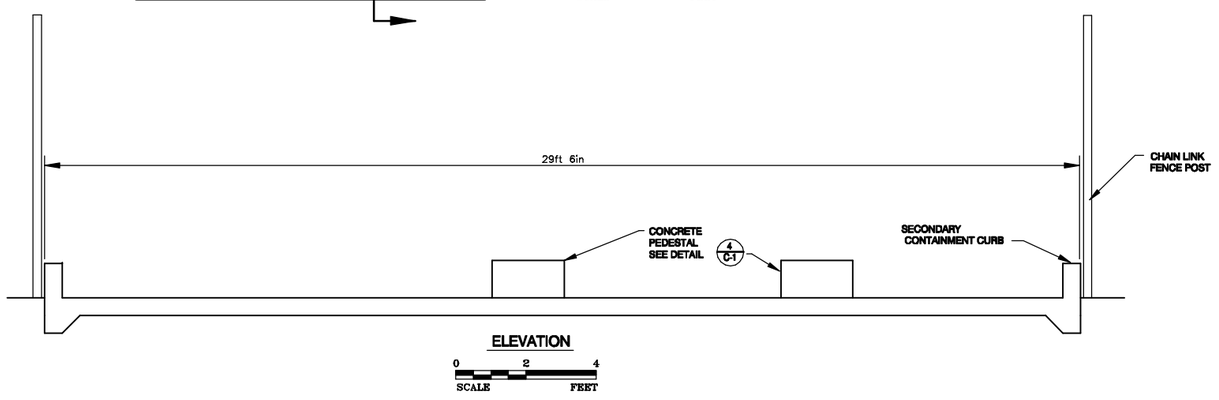
GENERATOR BUILDING SPH RECOVERY SYSTEM EQUIPMENT LAYOUT

CLIENT:	DEFENSE ENERGY SUPPLY CENTER DSFP OZOL
LOCATION:	700 CARQUINEZ SCENIC DR. MARTINEZ, CALIFORNIA
ACAD FILE: P-5_2	PROJECT NO.: 871197.1709
REV.: 2 (2/20/02)	
DES.: HS / DET.: ML / DATE: 7/15/97	FIGURE: P-5
PM:	PE/RG:



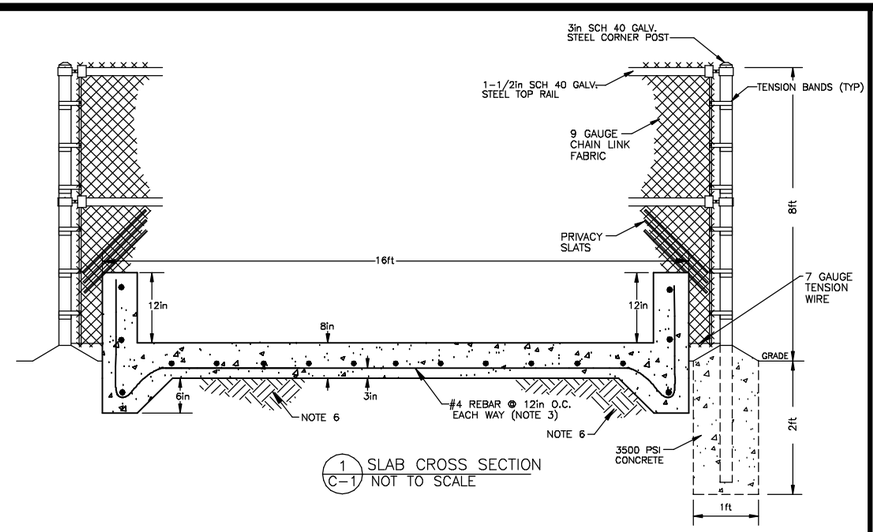
PLAN

SCALE 0 2 4 FEET

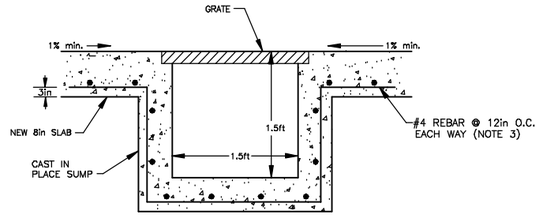


ELEVATION

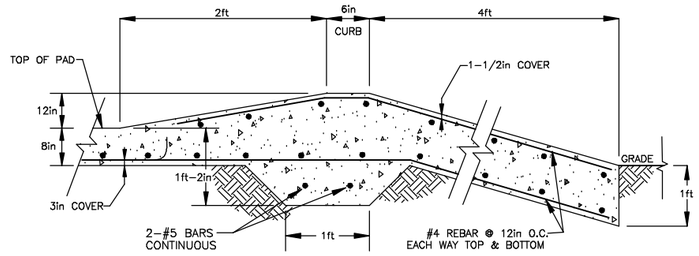
SCALE 0 2 4 FEET



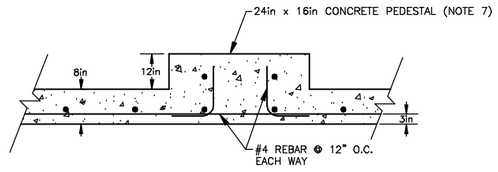
1 C-1 SLAB CROSS SECTION
NOT TO SCALE



2 C-1 SUMP CROSS SECTION
NOT TO SCALE



3 C-1 CONCRETE RAMP SECTION
NOT TO SCALE



4 C-1 EQUIPMENT PEDESTAL SECTION
NOT TO SCALE

LEGEND

CHAIN LINK FENCE

NOTES:

1. SEE GENERAL SPECIFICATIONS
2. INSPECTION REQUIRED AFTER TRENCHES ARE READY FOR CONCRETE AND ALL REQUIRED STEEL IS TIED IN PLACE.
3. MINIMUM OF 24 BAR DIAMETERS OVERLAP AT LOCATION OF REBAR SPLICES.
4. TREATMENT EQUIPMENT PAD SLOPED TO DRAIN INTO PAD SUMP.
5. T-300 IS MOUNTED ON EXISTING PAD, WHICH IS NORTH OF THE NEW PAD.
6. SUBBASE MATERIAL COMPACTED TO ACHIEVE BEARING CAPACITY GREATER THAN 1000 PSF. MINIMUM 6in CLASS II AB OR APPROVED ALTERNATIVE WITH 95% PROCTOR COMPACTION.
7. ANCHOR EQUIPMENT TO MEET 1991 UBC REQUIREMENTS.

GENERAL SPECIFICATIONS

PART 1 GENERAL

A. PERFORM WORK IN ACCORDANCE WITH ACI 301.
B. ACQUIRE CEMENT AND AGGREGATE FROM SAME SOURCE FOR ALL WORK.
C. CONFORM TO ACI 305R WHEN CONCRETING DURING HOT WEATHER.
D. CONFORM TO ACI 306R WHEN CONCRETING DURING COLD WEATHER.

PART 2 PRODUCTS

2.1 CONCRETE MATERIALS

A. CEMENT: ASTM C150, TYPE II.
B. FINE AND COARSE AGGREGATES: ASTM C33.

2.2 CONCRETE MIX

A. CONTRACTOR MIX DESIGN: ACI 301 EXCEPT AS MODIFIED HEREIN. CONCRETE SHALL HAVE A 28-DAY COMPRESSIVE STRENGHT OF 3000 PSI. SLUMP SHALL BE BETWEEN 2 AND 4 INCHES IN ACCORDANCE WITH ASTM C143.

PART 3 EXECUTIONS

3.1 PLACING CONCRETE

A. PLACE CONCRETE IN ACCORDANCE WITH (ACI 304) (ACI 301) (ACI 318).
B. ENSURE REINFORCEMENT IS NOT DISTURBED DURING CONCRETE PLACEMENT.

3.2 CURING AND PROTECTION

A. IMMEDIATELY AFTER PLACEMENT, PROTECT CONCRETE FROM PREMATURE DRYING, EXCESSIVELY HOT OR COLD TEMPERATURES, AND MECHANICAL INJURY.
B. MAINTAIN CONCRETE WITH MINIMAL MOISTURE LOSS AT RELATIVELY CONSTANT TEMPERATURE FOR PERIOD NECESSARY FOR HYDRATION OF CEMENT AND HARDENING OF CONCRETE.

3.3 REINFORCEMENT

A. REINFORCEMENT STEEL: ASTM A615 GRADE 60 DEFORMED BILLET STEEL BARS, UNFINISHED FINISH.
B. DOWELS: ASTM A615 GRADE 60 DEFORMED BILLET STEEL BARS, UNFINISHED FINISH.

3.4 APPLICATION OF EPOXY COATING

A. APPLY DURAL 304 EPOXY COATING (OR EQUIVALENT) ON ALL EXPOSED CONCRETE CONSTRUCTION.
B. FOLLOW MANUFACTURER'S INSTRUCTIONS FOR SURFACE PREPARATION, MIXING, AND APPLICATION.

NO.	DATE	BY	REVISION PURPOSE
3	2/20/02	JT	CHANGED TITLE
2	10/15/98	JT	AS-BUILT
1	1/19/98	JT	ISSUED FOR CONSTRUCTION
0	5/31/95	RAK	90% DESIGN SUBMITTAL

INTERNATIONAL TECHNOLOGY CORPORATION

DEFENSE ENERGY SUPPLY CENTER DFSP OZOL

700 CARQUINEZ SCENIC DR.
MARTINEZ, CALIFORNIA

TREATMENT EQUIPMENT PAD CONSTRUCTION DETAILS TFGRS

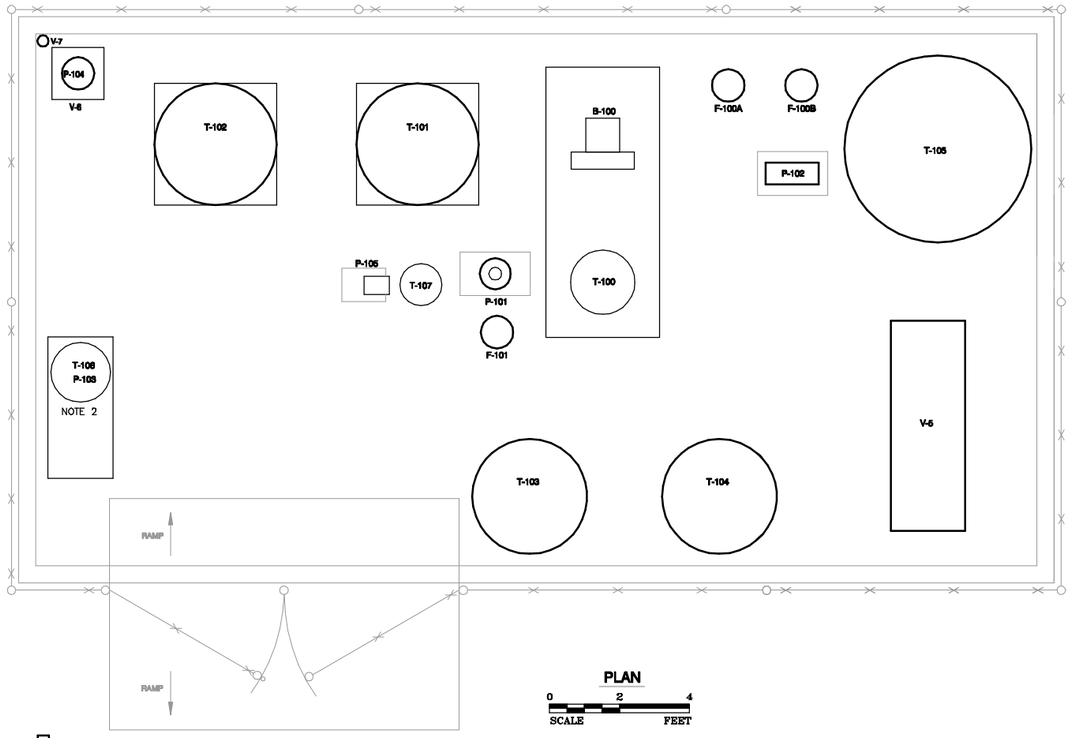
DESIGNED BY:	DRAWN BY:	CHECKED BY:
M. SUTTON, PE	ML	R.A. KATIN, PE

DATE:	FILE:
5/31/95	C-1_3

PROJECT NO.:	CONTRACT:
830011194	

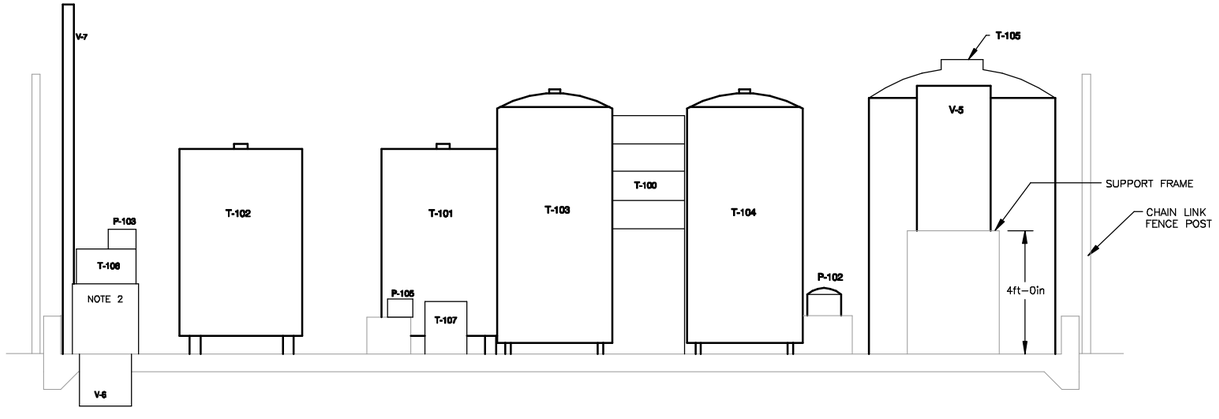
DRAWING: C-1 REVISION: - 3

NOTE 1



PLAN

0 2 4
SCALE FEET



ELEVATION

0 2 4
SCALE FEET

EQUIPMENT LIST

B-100	AIR STRIPPER BLOWER
F-F100A/F-100B	AIR STRIPPER FEED FILTERS
F-101	LIQUID PHASE GAC FEED FILTER
P-100	GW EXTRACTION PUMP
P-101	AIR STRIPPER EFFLUENT PUMP
P-102	AIR STRIPPER FEED PUMP
P-103	ACID INJECTION PUMP
P-104	SUMP PUMP
P-105	DEFOAMER INJECTION PUMP
P-200	PRODUCT SKIMMING PUMP
T-100	AIR STRIPPER
T-101/T-102	VAPOR PHASE GAC BEDS
T-103/T-104	LIQUID PHASE GAC BEDS
T-105	FEED SURGE TANK
T-106	ACID STORAGE TANK
T-107	DEFOAMER STORAGE TANK
V-5	OIL/WATER SEPARATOR
V-6	SECONDARY CONTAINMENT
V-7	STACK

LEGEND

CHAIN LINK FENCE

NOTES

1. T-200 IS MOUNTED ON EXISTING PAD, WHICH IS ON THE NORTH SIDE OF THE NEW PAD.
2. T-106 SITS INSIDE A SECONDARY CONTAINMENT TANK.

NO.	DATE	BY	REVISION PURPOSE
3	2/20/02	JT	ADDED F-101
2	10/15/98	JT	AS-BUILT
1	1/19/96	JT	ISSUED FOR CONSTRUCTION
0	5/31/95	RAK	90% DESIGN SUBMITTAL

INTERNATIONAL TECHNOLOGY CORPORATION

DEFENSE ENERGY SUPPLY CENTER DFSP OZOL

700 CARQUINEZ SCENIC DR.
MARTINEZ, CALIFORNIA

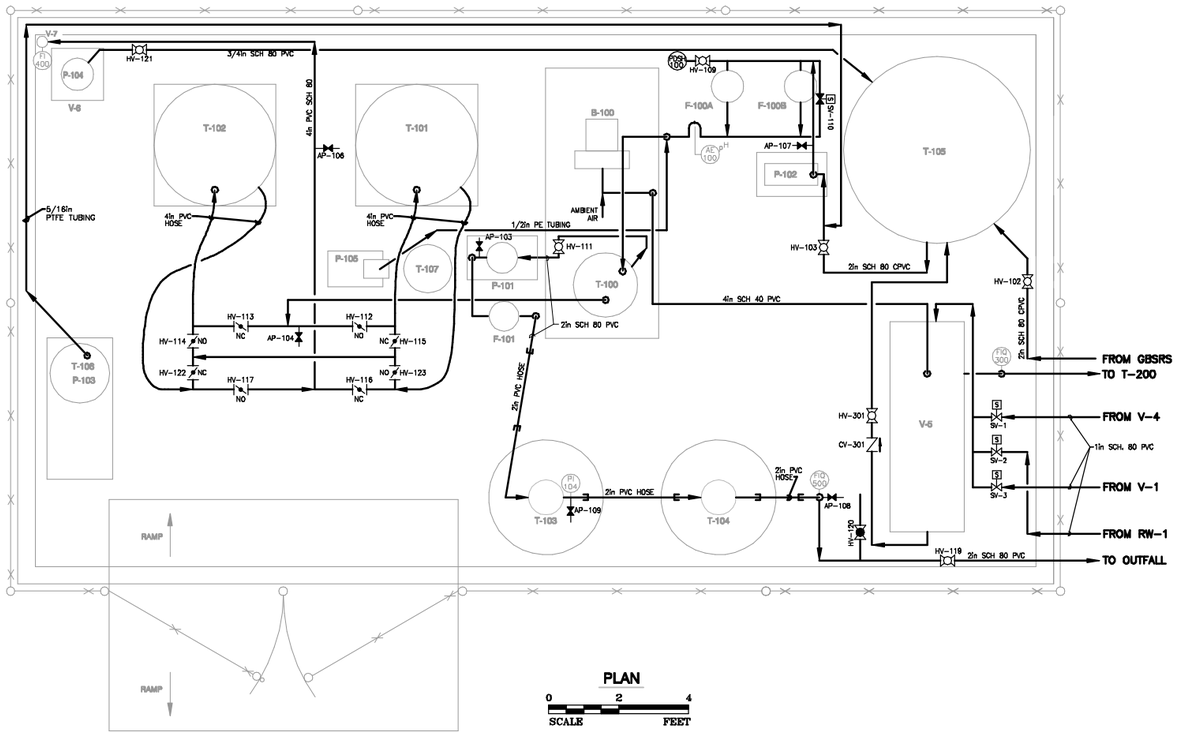
TREATMENT EQUIPMENT PAD LAYOUT TFGRS

DESIGNED BY:	DRAWN BY:	CHECKED BY:
D. ROBELLO	ML	R.A. KATIN, PE

DATE:	FILE:
5/31/95	M-1_3

PROJECT NO.:	CONTRACT:
830011194	

DRAWING: M-1 REVISION: - 3



PLAN

0 2 4

SCALE FEET

N

EQUIPMENT LIST

B-100	AIR STRIPPER BLOWER
F-100A/F-100B	AIR STRIPPER FEED FILTERS
F-101	LIQUID PHASE GAC FEED FILTER
P-100	GW EXTRACTION PUMP
P-101	AIR STRIPPER EFFLUENT PUMP
P-102	AIR STRIPPER FEED PUMP
P-103	ACID INJECTION PUMP
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T-100	AIR STRIPPER
T-101/T-102	VAPOR PHASE GAC BEDS
T-103/T-104	LIQUID PHASE GAC BEDS
T-105	FEED SURGE TANK
T-106	ACID STORAGE TANK
T-107	DEFOAMER STORAGE TANK
T-200	PRODUCT STORAGE TANK, EXISTING (NOTE 6)
V-5	OIL/WATER SEPARATOR
V-6	SECONDARY CONTAINMENT
V-7	STACK

LEGEND

CHAIN LINK FENCE

NOTES:

1. 10 PIPE DIAMETERS OF STRAIGHT RUN IN FRONT AND BACK OF FLOW METERS OR PITOT TUBES.
2. SEEP/HYDRAUGER COLLECTION SYSTEM PIPING SHALL CONSIST OF THE FOLLOWING:
   a) FROM V-1 = ONE 3/4in NYLON-REINFORCED PVC TUBING
   b) FROM V-2 & V-4 = TWO 1in NYLON-REINFORCED PVC TUBING
3. PIPES & HOSE SHOWN ON TOP OF CONTAINMENT CURB FOR CLARITY ONLY. THEY MUST BE INSTALLED ON THE INSIDE OF THE CONTAINMENT CURB.
4. TANK T-200 IS MOUNTED ON AN EXISTING CONCRETE PAD WHICH ABUTS THE PROPOSED NEW CONCRETE PAD ON THE WEST SIDE.
5. INSTRUMENT SYMBOLS ARE INDICATED ON DRAWING X-2C.
6. PRODUCT PIPE (1 INCH CS) TO GRAVITY DRAIN TO PRODUCT STORAGE TANK, T-200

SOLENOID – NORMALLY OPEN

SOLENOID – NORMALLY CLOSED

CHECK VALVE

BALL VALVE – NORMALLY OPEN

BALL VALVE – NORMALLY CLOSED

LAB COCK – NORMALLY CLOSED

BUTTERFLY VALVE

FLEXIBLE HOSE W/QUICK DISCONNECTS

NO.	DATE	BY	REVISION PURPOSE
3	2/21/02	JT	ADDED F-101, REV. INFLUENT
2	10/15/98	JT	AS-BUILT
1	1/19/98	JT	ISSUED FOR CONSTRUCTION
0	6/1/95	RAK	90% DESIGN SUBMITTAL

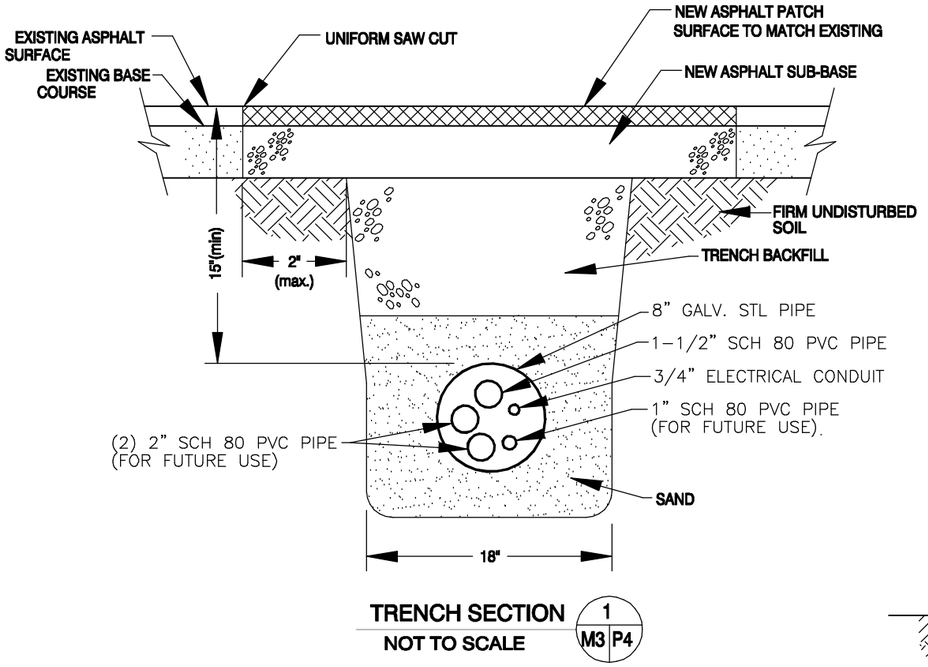
INTERNATIONAL TECHNOLOGY CORPORATION

DEFENSE ENERGY SUPPLY CENTER DFSP OZOL

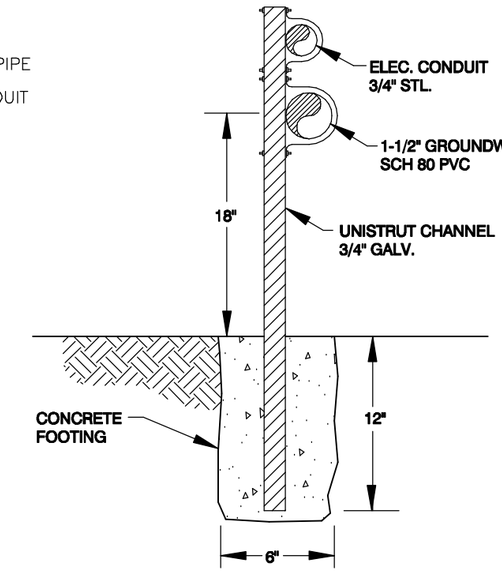
700 CARQUINEZ SCENIC DR.
MARTINEZ, CALIFORNIA

TREATMENT EQUIPMENT PAD MECHANICAL PIPING PLAN TFGRS

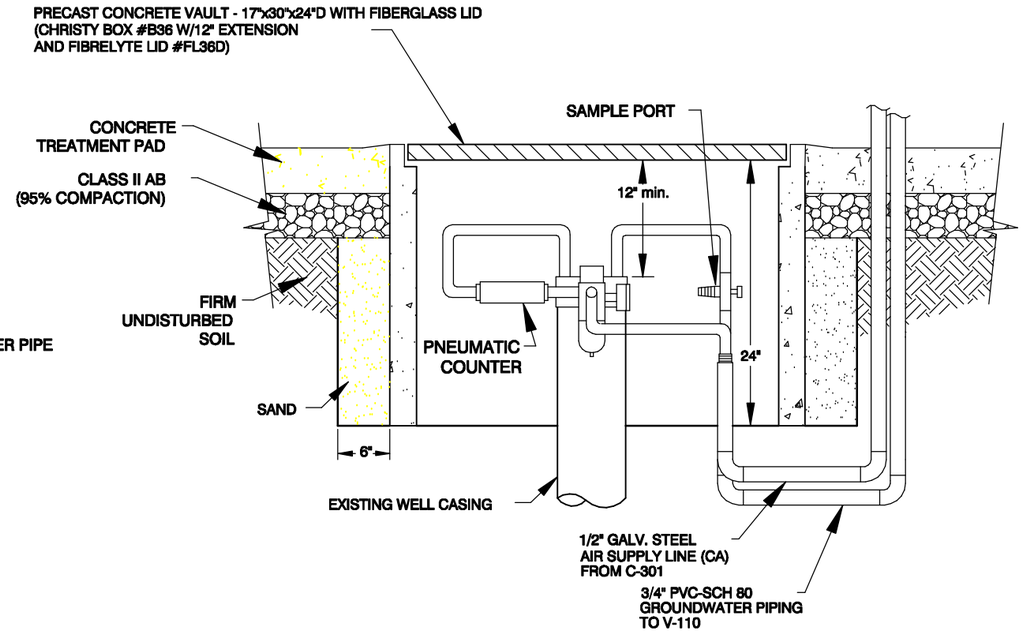
DESIGNED BY: D. ROBELLO	DRAWN BY: ML	CHECKED BY: R.A. KATIN, PE
DATE: 6/1/95		FILE: M-2_3
PROJECT NO.: 830011194		CONTRACT:
DRAWING: M-2		REVISION: - 3



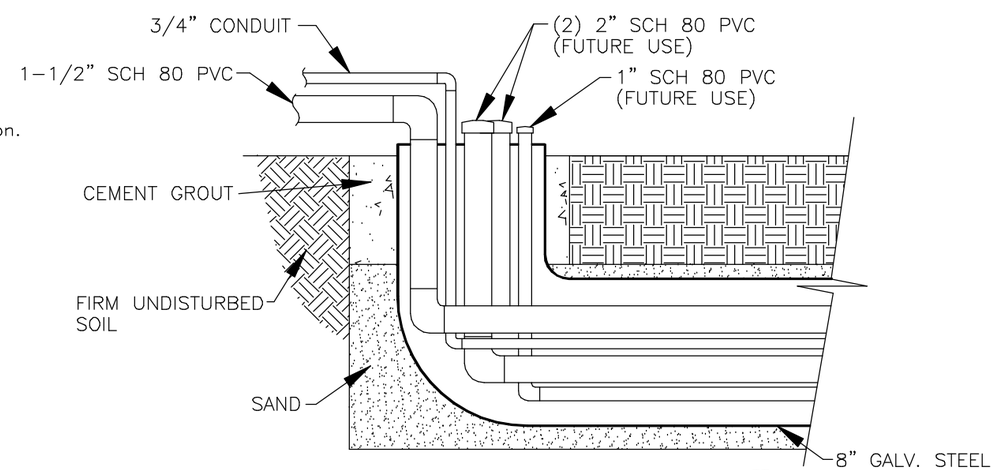
TRENCH SECTION 1 (M3 | P4)
NOT TO SCALE



PIPE SUPPORT DETAIL 2 (M3 | P4)
NOT TO SCALE



WELLHEAD SECTION 3 (M3 | M4)
NOT TO SCALE



PIPE DAYLIGHT DETAIL 4 (M3 | P4)
(TYP. OF BOTH SIDES OF ROAD)
NOT TO SCALE

SITE PREPARATION AND EARTHWORK

TRENCHING FOR UNDERGROUND UTILITIES

1. Side Walls
   - A. Make vertical or sloped within specified trench width limitations below a plane 12 inches above top of pipe.
   - B. Excavate without undercutting.
2. Trench Depth
   - A. Excavate to depth sufficient to provide the minimum bedding requirements for the pipe being placed.
   - B. Do not exceed indicated depth where condition of bottom are satisfactory.
   - C. Increase depth as necessary to remove unsuitable supporting materials.
3. Trench Bottom
   - A. Protect and maintain when suitable natural materials are encountered.
   - B. Remove rock fragments and materials disturbed during excavation or raveled from trench walls.
4. Trench Width
   - A. Excavate trench to a width which will permit satisfactory jointing of the pipe and thorough tamping of bedding.
5. Limit maximum length of open trench to 50 feet of any line under construction.

PIPE EMBEDMENT

1. Pipe bedding shall be placed as indicated using granular material.
2. Place granular embedment as follows:
   - A. With level bottom layer at proper grade to receive and uniformly support pipe barrel thoughout its length.
   - B. Form shallow depression under each joint to facilitate jointing.
   - C. Add second layer simultaneously to both sides of the pipe with care to avoid displacement.
   - D. Complete promptly after completion of jointing operations.

TRENCH BACKFILL

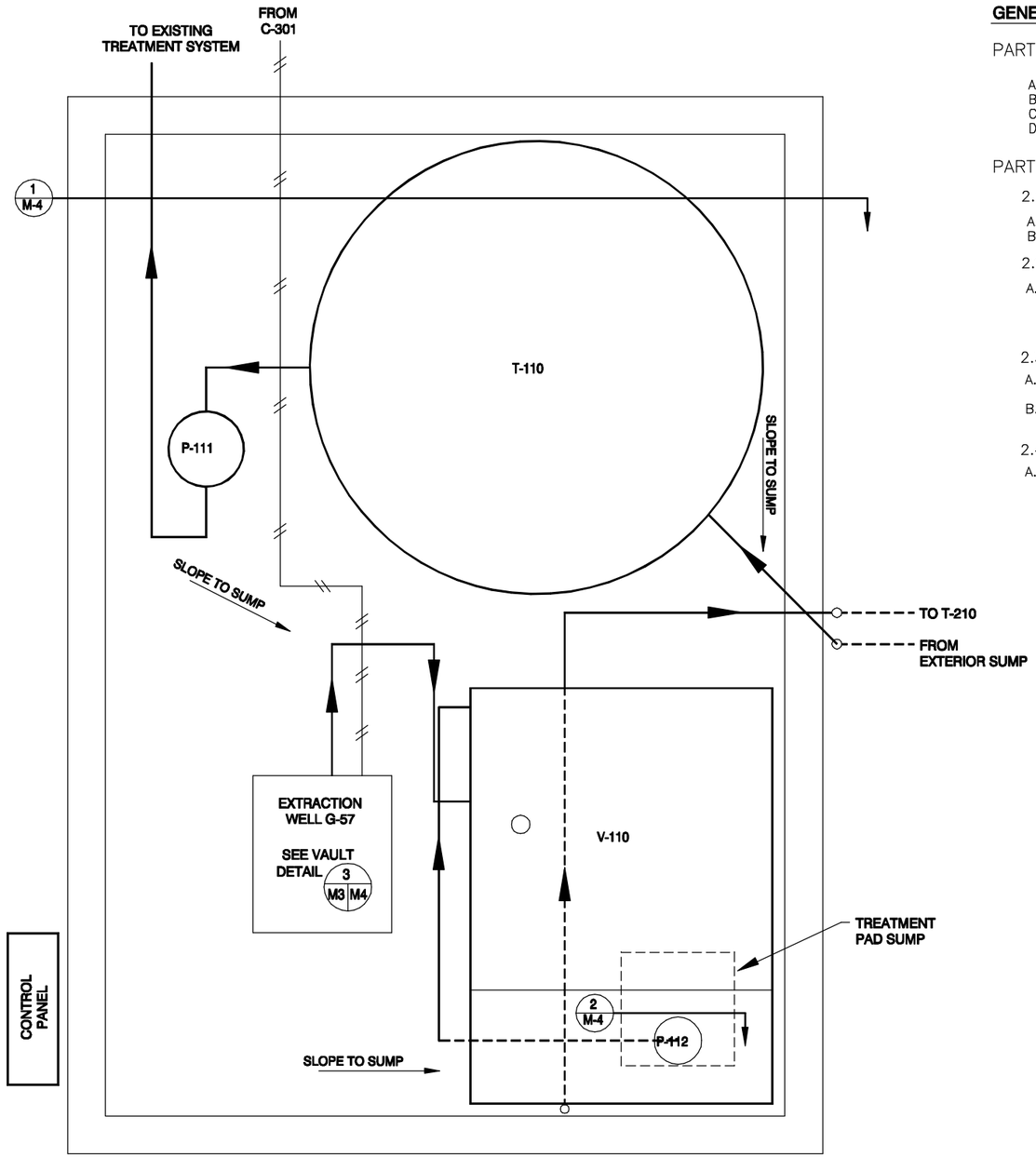
1. Backfill for trenches shall be as specified for structures and as follows:
   - A. Complete promptly upon completion of pipe embedment and approval to proceed.
   - B. Use hand methods to plane 12 inches above top of pipe.
   - C. Mechanical methods shall be acceptable where hand backfill is not required.
   - D. Backfill in layers of thickness within compacting ability of equipment used.
   - E. Until compacted depth over conduit exceeds 3 feet, do not drop fill material over 5 feet. Distance may then be increased 2 feet for additional foot cover.

INTERNATIONAL TECHNOLOGY CORPORATION

NOT TO SCALE

TRENCHING, PIPING, AND WELLHEAD DETAILS

CLIENT:	DEFENSE ENERGY SUPPLY CENTER DFSP OZOL
LOCATION:	700 CARQUINEZ SCENIC DR. MARTINEZ, CALIFORNIA
ACAD FILE: M-3_2	PROJECT NO.: 871194.1702
REV.:	2 (2/20/02)
DES.: MCS / DET.: ML	DATE: 11/4/96
PM:	PE/RG:
	FIGURE: M-3



PLAN VIEW

0 FEET 2

SCALE

EQUIPMENT LIST

C-301	AIR COMPRESSOR
P-111	TRANSFER PUMP
P-112	TREATMENT PAD SUMP PUMP
P-113	EXTERIOR SUMP PUMP
T-110	TRANSFER TANK
T-210	PRODUCT STORAGE TANK
V-110	OIL/WATER SEPARATOR

GENERAL SPECIFICATIONS

PART 1 GENERAL

A. PERFORM WORK IN ACCORDANCE WITH ACI 301.
B. ACQUIRE CEMENT AND AGGREGATE FROM SAME SOURCE FOR ALL WORK.
C. CONFORM TO ACI 305R WHEN CONCRETING DURING HOT WEATHER.
D. CONFORM TO ACI 306R WHEN CONCRETING DURING COLD WEATHER.

PART 2 PRODUCTS

2.1 CONCRETE MATERIALS

A. CEMENT: ASTM C150, TYPE II.
B. FINE AND COARSE AGGREGATES: ASTM C33.

2.2 CONCRETE MIX

A. CONTRACTOR MIX DESIGN: ACI 301 EXCEPT AS MODIFIED HEREIN. CONCRETE SHALL HAVE A 28-DAY COMPRESSIVE STRENGHT OF 3000 PSI. SLUMP SHALL BE BETWEEN 2 AND 4 INCHES IN ACCORDANCE WITH ASTM C143.

2.3 REINFORCEMENT

A. REINFORCEMENT STEEL: ASTM A615 GRADE 60 DEFORMED BILLET STEEL BARS, UNFINISHED FINISH.
B. DOWELS: ASTM A615 GRADE 60 DEFORMED BILLET STEEL BARS, UNFINISHED FINISH.

2.4 SUMP GRATE

A. GRATING SHALL BE CAPABLE OF SUPPORTING A 500lb LOAD. GRATING SHALL BE GLASS REINFORCED PLASTIC.

PART 3 EXECUTIONS

3.1 PLACING CONCRETE

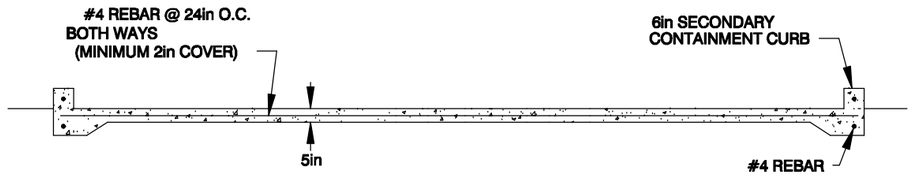
A. PLACE CONCRETE IN ACCORDANCE WITH ACI 304.
B. ENSURE REINFORCEMENT IS NOT DISTURBED DURING CONCRETE PLACEMENT.

3.2 CURING AND PROTECTION

A. IMMEDIATELY AFTER PLACEMENT, PROTECT CONCRETE FROM PREMATURE DRYING, EXCESSIVELY HOT OR COLD TEMPERATURES, AND MECHANICAL INJURY.
B. MAINTAIN CONCRETE WITH MINIMAL MOISTURE LOSS AT RELATIVELY CONSTANT TEMPERATURE FOR PERIOD NECESSARY FOR HYDRATION OF CEMENT AND HARDENING OF CONCRETE.

3.3 SURFACE FINISH

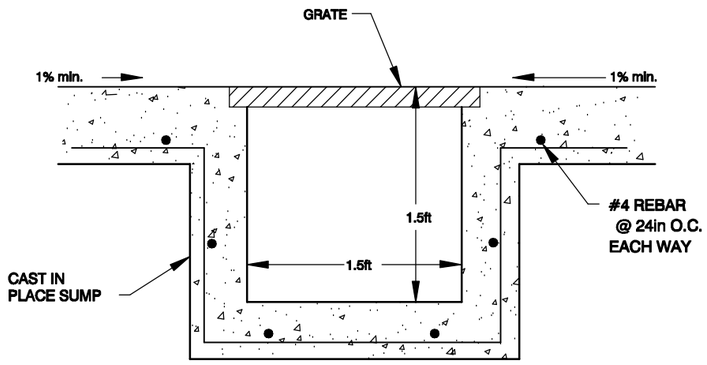
A. SURFACE OF CONCRETE SHALL HAVE BROOM FINISH.



1 M-4 TREATMENT PAD SECTION

0 FEET 2

SCALE



2 M-4 SUMP CROSS SECTION

NOT TO SCALE

INTERNATIONAL TECHNOLOGY CORPORATION

TREATMENT PAD SLAB DETAIL

CLIENT:	DEFENSE ENERGY SUPPLY CENTER DFSP OZOL
LOCATION:	700 CARQUINEZ SCENIC DR. MARTINEZ, CALIFORNIA
ACAD FILE: M-4_2	PROJECT NO.: 871194.1709
REV.:	2 (2/20/02)
DES.: HS	DET.: ML
DATE:	7/15/97
PM:	PE/RG:
FIGURE:	M-4

VALVE AND PIPING SYMBOLS

- LAB COCK VALVE
- GLOBE VALVE
- GATE VALVE
- BUTTERFLY VALVE
- CHECK VALVE
- PLUG VALVE
- 3–WAY VALVE
- ANGLE VALVE
- RELIEF OR SAFETY VALVE
- DIAPHRAGM VALVE
- BALL VALVE (NORMALLY OPEN)
- BALL VALVE (NORMALLY CLOSED)
- SELF–CONTAINED PRESSURE REGULATING VALVE W/RELIEF
- BACK PRESSURE VALVE
- KNIFE GATE VALVE
- BP BACKFLOW PREVENTER
- NO NORMALLY OPEN
- NC NORMALLY CLOSED
- FLEXIBLE HOSE
- BASKET TYPE STRAINER
- Y–TYPE STRAINER
- DUPLEX STRAINER
- SLEEVE COUPLING (SC)
- FLOOR DRAIN
- EQUIPMENT DRAIN
- CLEANOUT (CO)
- REMOVABLE PLUG
- REMOVABLE CAP
- BF BLIND FLANGE
- EXHAUST TO ATMOSPHERE (INSIDE)
- EXHAUST TO ATMOSPHERE (OUTSIDE)
- REDUCER
- UNION
- QUICK DISCONNECT COUPLING
- GAUGE SEAL
- ROTAMETER

VALVE OPERATOR SYMBOLS

- S SOLENOID
- M MOTOR, ELECTRIC
- DIAPHRAGM
- DIAPHRAGM WITH POSITIONER
- HANDWHEEL OR LEVER
- CHAINWHEEL

PRIMARY ELEMENT SYMBOLS – FLOW

- ORIFICE PLATE
- PITOT TUBE
- VENTURI OR FLOW TUBE
- FLUME
- WEIR
- TURBINE OR PROPELLER TYPE METER
- MAGNETIC FLOW METER

EQUIPMENT SYMBOLS

- SUBMERSIBLE PUMP
- PUMP
- PNEUMATIC DIAPHRAGM PUMP
- BLOWER
- AIR COMPRESSOR

GENERAL INSTRUMENT SYMBOLS

ONE VARIABLE	TWO VARIABLES	
○	○○	LOCALLY MOUNTED
⊖	⊖⊖	PANEL MOUNTED
⊖ (dashed)	⊖⊖ (dashed)	REAR–OF–PANEL MOUNTED
I		INTERLOCK
P		PURGE

LINE SYMBOLS

- PROCESS PIPES OR CHANNELS
- CONNECTION TO PROCESS, MECHANICAL LINK OR INSTRUMENT SUPPLY
- PNEUMATIC SIGNAL
- ELECTRIC SIGNAL
- CAPILLARY TUBING (FILLED SYSTEM)
- HYDRAULIC SIGNAL
- ELECTROMAGNETIC OR SONIC SIGNAL NO WIRING OR TUBING

INSTRUMENT IDENTIFICATION TABLE

	FIRST LETTER		SUCCEEDING LETTERS		
	MEASURED OR INITIATING VARIABLE	MODIFIER	READOUT OR PASSIVE FUNCTION	OUTPUT FUNCTION	MODIFIER
A	ANALYSIS		ALARM		
B	BURNER FLAME				
C	CONDUCTIVITY			CONTROL	
D	DENSITY (SP. GR.)	DIFFERENTIAL			
E	VOLTAGE		PRIMARY ELEMENT		
F	FLOW RATE	RATIO			
G	GAUGING (DIMENSIONAL)		GLASS		
H	HAND (MANUAL)				HIGH
I	CURRENT		INDICATE		
J	POWER	SCAN			
K	TIME OR SCHEDULE			CONTROL STATION	
L	LEVEL		LIGHT (PILOT)		LOW
M	MOISTURE OR HUMIDITY				MIDDLE
N					
O			ORIFICE		
P	PRESSURE OR VACUUM		POINT (TEST)		
Q	QUANT. OR EVENT	INTEGRATE			
R	RADIOACTIVITY		RECORD OR PRINT		
S	SPEED OR FREQ.	SAFETY		SWITCH	
T	TEMPERATURE			TRANSMIT	
U	MULTIVARIABLE		MULTIFUNCTION		
V	VISCOSITY			VALVE OR DAMPER	
W	WEIGHT OR FORCE		WELL		
X	UNCLASSIFIED		UNCLASSIFIED		
Y				RELAY OR COMPUTE	
Z	POSITION			DRIVE, ACTUATE	

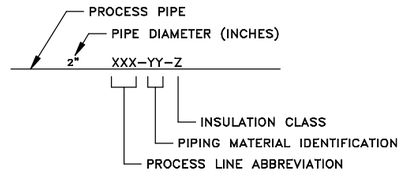
PROCESS LINE ABBREVIATIONS

AIR	AIR, ATMOSPHERIC PRESSURE
BW	BACKWASH
CA	COMPRESSED AIR
CAS	CASING
CGW	CONTAMINATED GROUNDWATER
D	DRAIN
EFF	EFFLUENT
EXH	EXHAUST
HP	HYDROGEN PEROXIDE
NPW	NON–POTABLE WATER
NUT	NON–POTABLE WATER
P	PRODUCT
PW	POTABLE WATER
S	SANITARY
SL	SLUDGE
SP	SAMPLE PORT
SS	STORM SEWER
TF	TOTAL FLUIDS
V	VENT
VAP	VAPOR

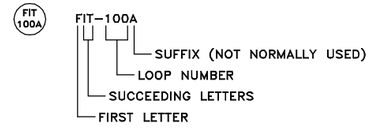
PIPING MATERIAL IDENTIFICATION

AL	ALUMINUM
CPVC	CHLORINATED POLYVINYL CHLORIDE
CSP	CARBON STEEL PIPE
COP	COPPER
CMP	CORRUGATED METAL PIPE
CIP	CAST IRON PIPE
DIP	DUCTILE IRON PIPE
GAL	GALVANIZED STEEL PIPE
PE	POLYETHYLENE
PP	POLYPROPYLENE
PTFE	POLYTETRAFLUORETHYLENE
PVC	POLYVINYL CHLORIDE
RCP	REINFORCED CONCRETE PIPE
RUB	RUBBER HOSE
SS	STAINLESS STEEL
TUB	TUBING
VCP	VITRIFIED CLAY PIPE

PROCESS PIPING IDENTIFICATION



INSTRUMENT IDENTIFICATION



FUNCTION ABBREVIATIONS

DO	DISSOLVED OXYGEN	OC	OPEN–CLOSE
FC	FAIL CLOSED	OO	ON–OFF (MAINTAINED)
FI	FAIL INDETERMINATE	ORP	OXIDATION REDUCTION POTENTIAL
FL	FAIL LOCKED	OSC	OPEN–STOP–CLOSE (MOMENTARY)
FO	FAIL OPEN	SS	START–STOP (MOMENTARY)
HOA	HAND–OFF–AUTOMATIC	>	HIGH SELECT
I/I	CURRENT–TO–CURRENT	<	LOW SELECT
I/P	CURRENT–TO–PNEUMATIC	√‾	SQUARE ROOT
LEL	LOWER EXPLOSIVE LIMIT	Σ	ADD OR TOTALIZE
LR	LOCAL–REMOTE		

NO.	DATE	BY	REVISION PURPOSE
2	2/20/02	JHT	AS–BUILT
1	1/19/96	JHT	ISSUED FOR CONSTRUCTION

INTERNATIONAL TECHNOLOGY CORPORATION

DEFENSE ENERGY SUPPLY CENTER
DFSP OZOL

700 CARQUINEZ SCENIC DR.
MARTINEZ, CALIFORNIA

PIPING & INSTRUMENT DRAWING LEGEND

DESIGNED BY:	DRAWN BY:	CHECKED BY:
	ML	

DATE:	FILE:
1/19/96	X–0_2

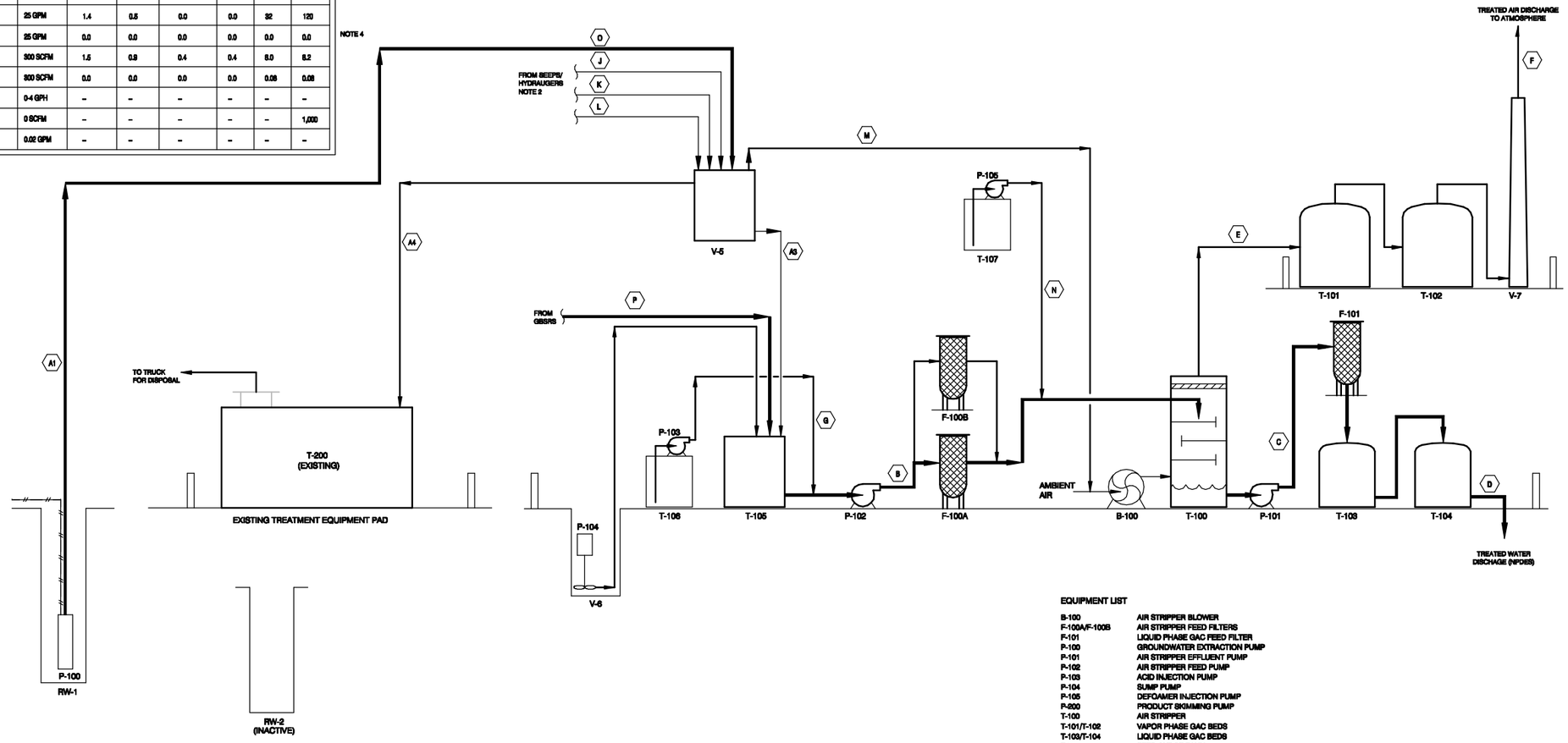
PROJECT NO.:	CONTRACT:
830011194	

DRAWING: X–0 REVISION: – 2

	STREAM DESCRIPTION	FLOW	CHEMICAL COMPOSITION (CONCENTRATIONS IN ug/l) BENZENE	TOLUENE	ETHYLBENZENE	XYLENE	AV GAS	JP-08
A1	GROUNDWATER	20 GPM	880	410	200	224	4,025	0.0
A2	FREE PRODUCT	0.1 GPM	–	–	–	–	–	–
A3	SEEP/HYDRAUGER WATER	4.9 GPM	0.0	0.0	0.0	0.0	0.0	29,350
A4	FREE PRODUCT	0.1 GPM	–	–	–	–	–	–
B	AIR STRIPPER FEED	25 GPM	460	330	160	160	3,200	5,900
C	AIR STRIPPER EFFLUENT	25 GPM	1.4	0.5	0.0	0.0	32	120
D	TREATED WATER	25 GPM	0.0	0.0	0.0	0.0	0.0	0.0
E	AIR STRIPPER VENT GAS	300 SCFM	1.5	0.9	0.4	0.4	8.0	8.2
F	TREATED AIR DISCHARGE	300 SCFM	0.0	0.0	0.0	0.0	0.08	0.08
G	ACID INJECTION	0-4 GPH	–	–	–	–	–	–
M	V-5 VENT	0 SCFM	–	–	–	–	–	1,000
N	DEFOAMER INJECTION	0.02 GPM	–	–	–	–	–	–

NOTE 1

NOTE 4



EQUIPMENT LIST

B-100	AIR STRIPPER BLOWER
F-100A/F-100B	AIR STRIPPER FEED FILTERS
F-101	LIQUID PHASE GAC FEED FILTER
P-100	GROUNDWATER EXTRACTION PUMP
P-101	AIR STRIPPER EFFLUENT PUMP
P-102	AIR STRIPPER FEED PUMP
P-103	ACID INJECTION PUMP
P-104	SUMP PUMP
P-105	DEFOAMER INJECTION PUMP
P-200	PRODUCT SKIMMING PUMP
T-100	AIR STRIPPER
T-101/T-102	VAPOR PHASE GAC BEDS
T-103/T-104	LIQUID PHASE GAC BEDS
T-105	FEED SURGE TANK
T-106	ACID STORAGE TANK
T-107	DEFOAMER STORAGE TANK
T-200	PRODUCT STORAGE TANK
V-5	OIL/WATER SEPARATOR
V-6	SECONDARY CONTAINMENT
V-7	STACK

RW-2
GW RECOVERY WELL

8in DIA STAINLESS STEEL
0.02in SLOT
25ft SLOTTED ZONE
GW AT 8-10ft BGS
TOTAL DEPTH 30ft BGS

P-100
GROUNDWATER EXTRACTION PUMP

MAKE: GED
MODEL: HAMMERHEAD
POWER: PNEUMATIC
PUMP: TOTAL FLUIDS

RW-1
GPH RECOVERY WELL

30 in. DIA GALVANIZED STEEL
0.04 in. SLOT
15 ft. SLOTTED ZONE
TOTAL DEPTH 15 ft. BGS

P-200
PRODUCT SKIMMING PUMP

0.5 gpm @ 90ft TDH
ORS MODEL "SCAVENGER"
4in DIA
MOTOR 12V DC
PUMP: GEAR TYPE

T-200
PRODUCT STORAGE TANK (EXISTING)

500 GALLON
CARBON STEEL W/EPOXY COATING

P-104
SUMP PUMP

22 GPM @ 16ft TDH
UPRIGHT SUMP PUMP
COLUMN HEIGHT 48in (MIN)
MAKE: TEEL
MODEL: 4P032 (GRAINGER)
MOTOR: 1/3hp, 115V, 1Ø, TEFC, 1725 RPM
PUMP: BRONZE IMPELLER AND BASE

T-106
ACID STORAGE TANK

PRIMARY TANK CAPACITY: 50 GAL
SECONDARY TANK CAPACITY: 90 GAL
CONSTRUCTION: PE

V-5
OIL/WATER SEPARATOR

MAKE: H2OIL RECOVERY EQUIPMENT, INC.
CAPACITY: 350 GALLON
DIMENSIONS: 72in x 24in x 46in HIGH
CONSTRUCTION: CARBON STEEL W/
48in HIGH ANGLE IRON STAND
FITTINGS: INLET - 3in NPT (SIDE)
OUTLET - 3in NPT (SIDE)
ACCESS - 3-2in NPT (TOP)

V-6
SECONDARY CONTAINMENT

3200 GALLON CAPACITY
DIMENSIONS: 16ft x 28ft x 1ft HIGH
SUMP: 2ft GALLON CAPACITY
SUMP DIMENSIONS: 1.5ft DIA x 2ft DEEP

T-100
AIR STRIPPER

25 gpm, 4 TRAY
MAKE: QED RZ-4.4P
CONSTRUCTION: HDPE

P-102
AIR STRIPPER FEED PUMP

25 gpm @ 53ft TDH
MAKE: MARCH PUMPS
MODEL: TE-7R-MD
MOTOR 3/4 Hp, 230/460V, 3Ø, 60 Hz TEFC,
PUMP: CLOSE COUPLED

T-105
FEED SURGE TANK

MAKE: POLY PROCESSING
MODEL: 725-U
CAPACITY: 1,000 gal
DIMENSIONS: 94in DIA x 6ft 9in HIGH
MATERIALS: XL-HDPE, BLACK
FITTINGS: TOP-
ONE 2in PVC SCH 80 BULKHEAD TYPE
FITTINGS: 6in FROM TOP-
ONE 2in PVC SCH 80 BULKHEAD TYPE
ONE 2in CPVC SCH 80 BULKHEAD TYPE
ONE 3/4in PVC SCH 80 BULKHEAD TYPE
FITTINGS: 7in FROM TOP-
ONE 2in PVC SCH 80 BULKHEAD TYPE
FITTINGS: 9in FROM TOP-
ONE 2in PVC SCH 80 BULKHEAD TYPE
FITTINGS: 6in FROM BOTTOM-
ONE 2in PVC SCH 80 BULKHEAD TYPE
FITTINGS: 9in FROM BOTTOM-
ONE 2in PVC SCH 80 BULKHEAD TYPE

T-107
DEFOAMER STORAGE TANK

5 GAL BUCKET

P-103
ACID INJECTION PUMP

PUMP: LMI MODEL B721-1985
2.5 GPH @ 100psi
CONTROLLER: PULSE OUTPUT
LMI MODEL MP-100A-P
4-20 MA SIGNAL CONVERTER
TRANSMITTER: SIGNET MODEL 3-8710
pH TRANSMITTER (0-14pH)
(REQUIRES 10-30 VDC)
ELECTRODE: SIGNET MODEL 3-2716
BULKHEAD TYPE pH ELECTRODE
MOUNTED IN SIGNET MODEL PV 85020
PVC 2in PIPE SADDLE
PRE-AMP: SIGNET MODEL 3-2720

P-105
DEFOAMER INJECTION PUMP

PUMP: LMI MODEL A161-75 HV
2.0 GPH @ 50 PSI

F-101
LIQUID PHASE GAC FEED FILTER

MAKE: FILTRATION SYSTEMS
MODEL: NS-122
FLOW RATE, MAX.: 90 GPM
PRESSURE, MAX.: 150 PSI

F-100A/F-100B
AIR STRIPPER FEED FILTERS

MAKE: HARMSCO
HOUSING MODEL: HIF 7KE
ELEMENT MODEL: CDI-75-9-3/4, 75u, 7/HOUSING
FLOW RATE, MAX: 50 GPM
PRESSURE, MAX: 150 psi

B-100
AIR STRIPPER BLOWER

MAKE: NEW YORK BLOWER
MODEL: 2004A
FLOW RATE: 200 CFM
MOTOR 3 Hp, 208-230/460 VAC, 3Ø, TEXP,

P-101
AIR STRIPPER EFFLUENT PUMP

100 gpm @ 89ft TDH
MAKE: GOULDS
MODEL: 4-SV3
MOTOR: 5 Hp, 230/460V, 3Ø, 60 Hz TEFC,
PUMP: MULTI-STAGE CENTRIFIGAL
STAINLESS STEEL
VITON/SILICON CARBIDE SEAL

V-7
STACK

DIMENSIONS: 4in DIA x 10ft HIGH
CONSTRUCTION: PVC SCH 80 PIPE

T-103/T-104
LIQUID PHASE GAC BEDS

MAKE: CETCO
CARBON WET: 750 LBS
FLOW, MAX: 35 GPM
PRESSURE, MAX: 100 psi
CONSTRUCTION: FRP
DIMENSIONS: 3ft DIA x 6ft HIGH
FITTINGS: TWO 1in NPT - TOP

T-101/T-102
VAPOR PHASE GAC BEDS

MAKE: WESTATES CARBON
MODEL: VENT SCRUB 1200
CARBON WET: 1,000 LBS
FLOW, MAX: 800 CFM
PRESSURE, MAX: 15 psig
CONSTRUCTION: STEEL
DIMENSIONS: 46in DIA x 82in HIGH
FITTINGS: 4in FNPT, INLET-TOP,
OUTLET-SIDE/BOTTOM

NOTES:

1. DESIGN BASIS CONCENTRATIONS TAKEN FROM WELLS GT-6 AND GT-7 DURING 1/18/94 SAMPLING.
2. SEE DRAWING X-1B, PROCESS FLOW DIAGRAM, SEEP/HYDRAUGER COLLECTION SYSTEM.
3. PROVIDE EQUIPMENT DESCRIBED BELOW, OR EQUIVALENT.
4. BASED ON MATERIAL BALANCE CALCULATIONS, TREATED WATER EFFLUENT WILL HAVE NO DETECTABLE CONCENTRATIONS OF THE CONTAMINANTS LISTED.

NO.	DATE	BY	REVISION PURPOSE
4	2/25/02	JT	ADDED F-101, CHG P-101
3	10/15/96	JT	AS-BUILT
2	1/19/96	JT	ISSUED FOR CONSTRUCTION
1	5JUN95	RAK	90% DESIGN SUBMITTAL
0	2NOV94	JT	30% DESIGN SUBMITTAL

INTERNATIONAL TECHNOLOGY CORPORATION

DEFENSE ENERGY SUPPLY CENTER DFSP, OZOL

700 CARQUINEZ SCENIC DR.
MARTINEZ, CALIFORNIA

PROCESS FLOW DIAGRAM TFGRS

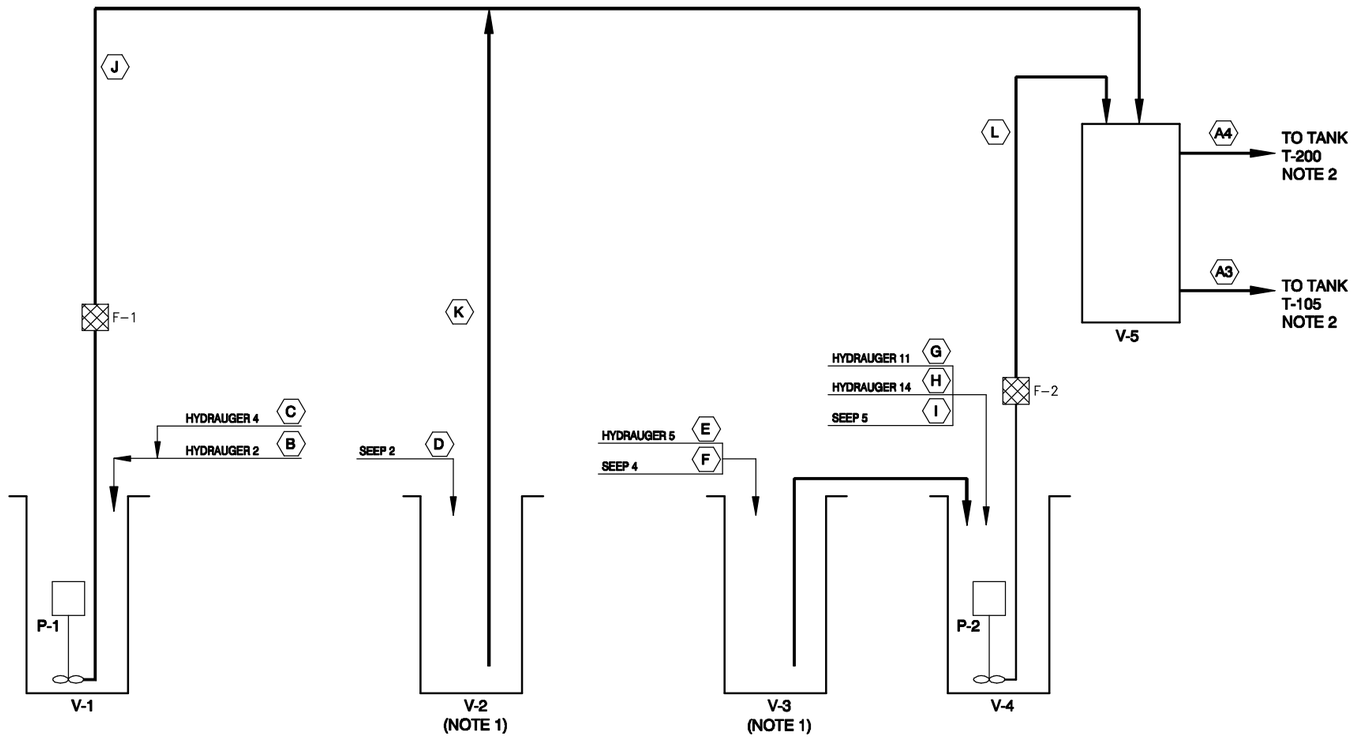
DESIGNED BY:	DRAWN BY:	CHECKED BY:
Greg Scott	ML	Joe Tulskie, PE

DATE:	FILE:
2 NOV 94	X1A_4

PROJECT NO.:	CONTRACT:
830011194	

DRAWING: X-1A
REVISION: - 4

	STREAM DESCRIPTION	FLOW RATE (GPM)	CONCENTRATION OF JP-8 (ug/l)
A	–	–	–
B	H2 (V1 INFLUENT)	1.0	260
C	H4 (V1 INFLUENT)	0.5	4,300
D	S2 (V2 INFLUENT)	0.6	6,300
E	H5 (V3 INFLUENT)	0.2	100
F	S4 (V3 INFLUENT)	1.0	100,000
G	H11 (V4 INFLUENT)	0.2	190,000
H	H14 (V4 INFLUENT)	1.0	2,400
I	S5 (V4 INFLUENT)	0.2	290
J	V1 COLLECTION SUMP	2.1	2,900
K	V2 COLLECTION SUMP	0.6	5,400
L	V4 COLLECTION SUMP	2.6	54,000
A3	FEED STREAM TO T-105	4.6	29,000
A4	FEED STREAM TO T-200	0.1	NA



V-1 FED FROM HYDRAUGER 2 (H2)
H2 IS 12" DIA STEEL CULVERT

V-2 FED FROM SEEP No. 2 (S2)
H4 IS 6" DIA CULVERT (NOTE 1) AND FEEDS INTO H2

V-3 FED FROM HYDRAUGER 5 (H5) AND SEEP No. 4 (S4)
H5 IS 5" DIA PIPE (NOTE 1)

V-4 FED FROM HYDRAUGERS 11 & 14 (H11,H14) AND SEEP No. 5 (S5)
H11 IS 2" DIA STEEL PIPE
H14 IS 12" DIA STEEL CULVERT

V-1 and V-4 LIFT STATION SUMPS

30in Diameter x 78in HIGH,
FRP CONSTRUCTION, 230 gallons

V-2 and V-3 RETAINING WALL/CONTAINMENT SUMPS

84in Wide x 132in Long x 24in Deep, 1152 gallons
POURED CONCRETE CONSTRUCTION
(BY OTHERS)

P-1 LIFT STATION PUMP

MAKE: BARNES SUBMERSIBLE EFFLUENT PUMP
MODEL: STEP 522L
MOTOR: 1/2hp, 460V, 3ø, TEFC, 3450 RPM
PUMP: 4 GPM @ 60ft TDH
CONTROLS: LEVEL CONTROL
NEMA 4 CONTROL PANEL
W/INTRINSICALLY SAFE RELAY

P-2 LIFT STATION PUMP

MAKE: GROUNDFOS
MOTOR: 1hp, 460V, 3ø, TEFC, 3450 RPM
PUMP: 4 GPM @ 116ft TDH
CONTROLS: LEVEL CONTROL
NEMA 4 CONTROL PANEL
W/INTRINSICALLY SAFE RELAY

F-1 & F-2 GROUNDWATER FILTERS

MAKE: HARMSCO
FILTER HOUSING MODEL: HIF-7KE
FLOW RATE: 30 GPM MAX
ELEMENT MODEL: GX75-9-3/4, 75 MICRONS
7 ELEMENTS PER HOUSING
MAX PRESSURE: 150 psi

V-5 OIL/WATER SEPARATOR

MAKE: H2OIL RECOVERY EQUIPMENT, INC.
CAPACITY: 350 GAL CARBON STEEL
24in W x 72in L x 48in H
3in SIDE INLET/OUTLET
NPT CONNECTIONS
3-2in TOP NPT CONNECTIONS
ANGLE IRON STAND (48in HIGH)

NOTES:

1. V-2 WILL GRAVITY DRAIN TO V-1.
V-3 WILL GRAVITY DRAIN TO V-4 VIA H-14.
ALL COLLECTION SUMPS (V-1 thru V-4) ARE GRAVITY FED FROM SEEPS OR HYDRAUGERS.
2. THE AIR STRIPPER FEED SURGE TANK (T-105) AND PRODUCT STORAGE TANK (T-200) ARE PART OF THE INTERCEPTOR TRENCH TREATMENT SYSTEM. SEE DRAWINGS X-1A AND X-2A.

EQUIPMENT LIST

F-1 & F-2	GROUNDWATER FILTERS
P-1 & P-2	TRANSFER PUMPS
V-1	LIFT STATION SUMP
V-2, V-3 AND V-4	RETAINING WALL/CONTAINMENT SUMPS (UNDER ANOTHER CONTRACT)
V-5	OIL/WATER SEPARATOR

NO.	DATE	BY	REVISION PURPOSE
3	2/20/02	JT	REV. V-2 DISCHARGE
3	10/15/96	JT	AS-BUILT
2	1/19/96	JT	ISSUED FOR CONSTRUCTION
1	5/26/95	RAK	90% DESIGN SUBMITTAL
0	2/16/95	RAK	30% DESIGN SUBMITTAL

INTERNATIONAL TECHNOLOGY CORPORATION

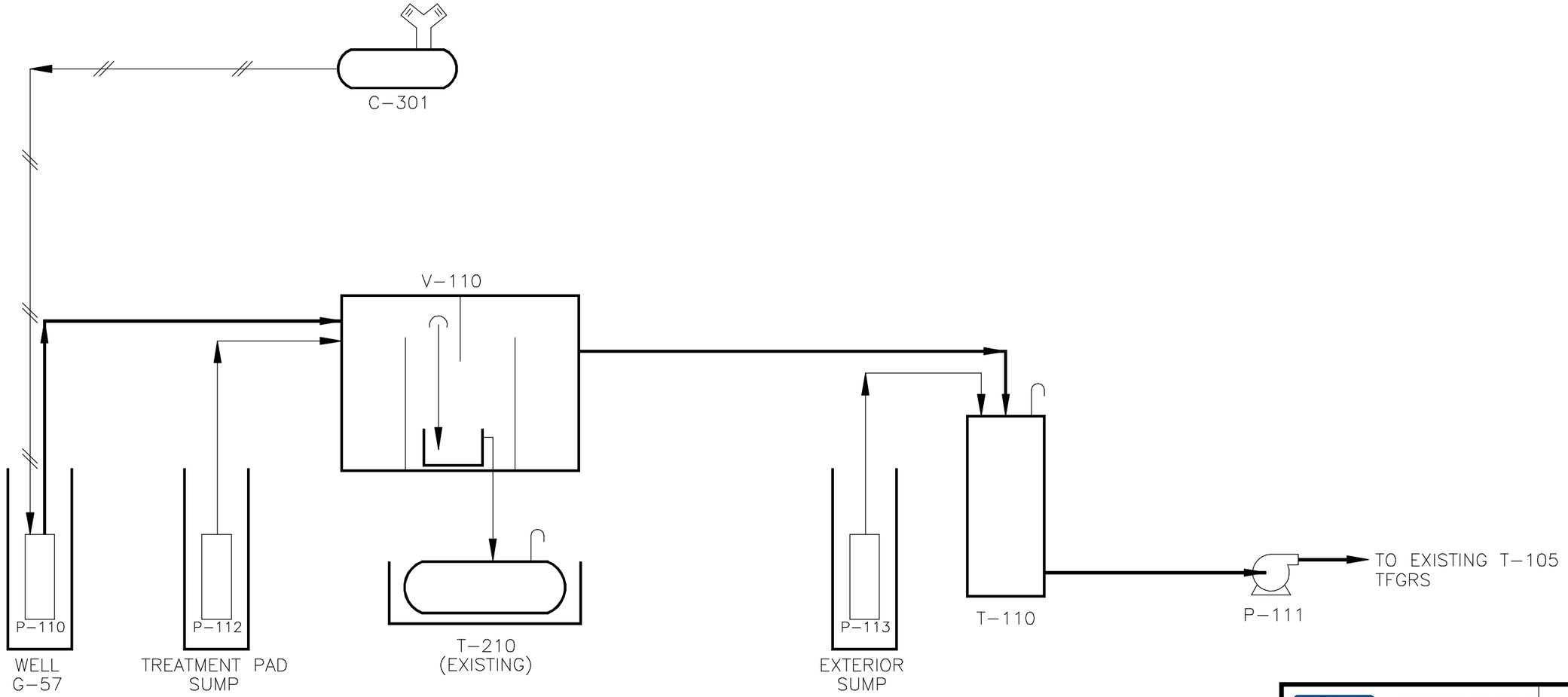
DEFENSE ENERGY SUPPLY CENTER DFSP OZOL

700 CARQUINEZ SCENIC DR.
MARTINEZ, CALIFORNIA

PROCESS FLOW DIAGRAM TFGRS

DESIGNED BY:	DRAWN BY:	CHECKED BY:
G. ERICKSON	ML	R.A. KATIN, PE

DATE: 2/16/95	FILE: X-1B_4
PROJECT NO.: 830011194	CONTRACT:
DRAWING: X-1B	REVISION: - 4



P–110
TOTAL FLUIDS PUMP
HAMMERHEAD HF45BEB
4" TOP INLET PNEUMATIC

C–301
AIR COMPRESSOR
INGERSOLL–RAND T–30
MODEL NO. 2545DIO
30 ICFM, 125 PSI

V–110
OIL/WATER SEPARATOR
ENVIROSYS INT'L AGS2–1
20 GPM WATER, 5 PGM OIL
WATER VOLUME: 150 GAL
48"L x 48"W x 20" HIGH

T–210
PRODUCT STORAGE TANK
PRIMARY TANK:
240gal, 40"dia, 55" LONG
SECONDARY TANK:
310gal
UL 142 LISTED

T–110
TRANSFER TANK
VOLUME: 700 GAL
CONSTRUCTION: HDPE
SIZE: 72" DIA x 40" HIGH

P–111
TRANSFER PUMP
GRUNDFOS CR4–80V
22 GPM @ 288' TDH
3 HP, 3ø, 480V, 3450 RPM
3.9 AMPS, TEFC

P–112
TREATMENT PAD SUMP PUMP
FLOW: 500 GPH @ 20' TDH
1/2 HP, 115V, 1ø, TEFC

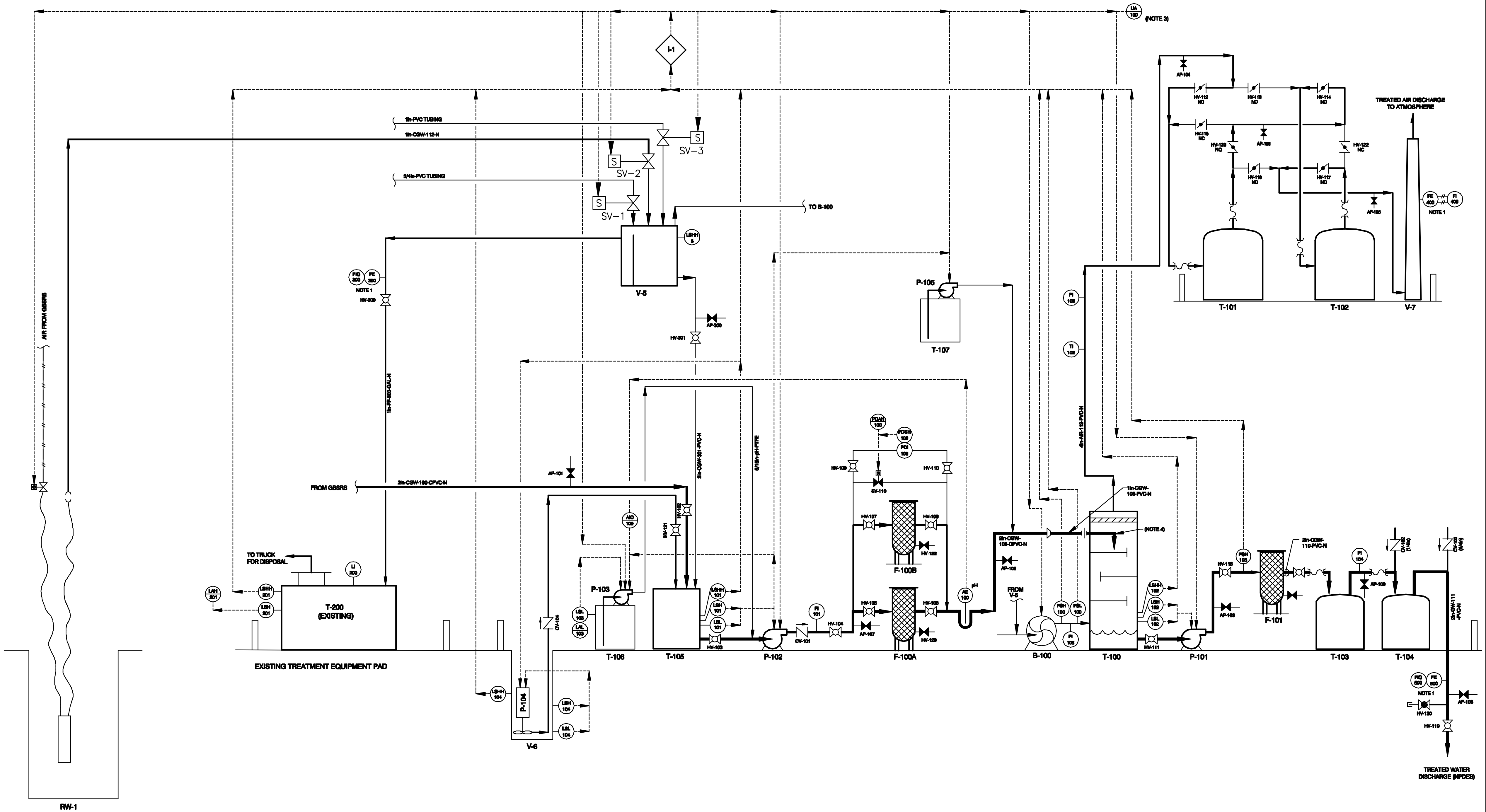
P–113
EXTERIOR SUMP PUMP
FLOW: 4 GPM @ 116' TDH
1.0 HP, 460V, 3ø, 3450 RPM
2.8 AMPS

INTERNATIONAL TECHNOLOGY CORPORATION

NOT TO SCALE

GENERATOR BUILDING SPH RECOVERY SYSTEM PROCESS FLOW DIAGRAM

CLIENT:	DEFENSE ENERGY SUPPLY CENTER DFSP OZOL
LOCATION:	700 CARQUINEZ SCENIC DR. MARTINEZ, CALIFORNIA
ACAD FILE: X-1C_2	PROJECT NO.: 871194.1709
REV.:	2 (2/20/02)
DES.: HS / DET.: ML / DATE: 7/15/97	FIGURE: X-1C
PM:	PE/RG:



NOTES:

1. MAINTAIN 10 DIAMETER LENGTHS OF STRAIGTH RUN UPSTREAM AND 5 DIAMETER LENGTHS OF STRAIGHT RUN DOWNSTREAM OF FLOW ELEMENTS.
2. SEE DRAWING X-2B, PIPING AND INSTRUMENT DRAWING, SEEP/HYDRAUGER COLLECTION SYSTEM.
3. ALL SHUTDOWN ALARMS WILL FEED TO A COMMON UNIT ALARM, UA-100. AFTER 5 MINUTES THE ALARM WILL SILENCE.
4. A 1/8in DIA ANTI-SYPHON HOLE IS DRILLED IN THE AIR STRIPPER FEED PIPE.

EQUIPMENT LIST

B-100	AIR STRIPPER BLOWER
F-100A/F-100B	AIR STRIPPER FEED FILTERS
F-101	LIQUID PHASE GAC FEED FILTER
P-100	GROUNDWATER EXTRACTION PUMP
P-101	AIR STRIPPER EFFLUENT PUMP
P-102	AIR STRIPPER FEED PUMP
P-103	ACID INJECTION PUMP
P-104	SUMP PUMP
P-105	DEFOAMER INJECTION PUMP
P-200	PRODUCT SKIMMING PUMP
T-100	AIR STRIPPER
T-101/T-102	VAPOR PHASE GAC BEDS
T-103/T-104	LIQUID PHASE GAC BEDS
T-105	FEED SURGE TANK
T-106	ACID STORAGE TANK
T-107	DEFOAMER STORAGE TANK
T-200	PRODUCT STORAGE TANK
V-5	OIL/WATER SEPARATOR
V-6	SECONDARY CONTAINMENT
V-7	STACK
V-8	GAC VENT FILTER

NO.	DATE	BY	REVISION PURPOSE
4	2/21/02	JT	REV. RW-1, ADDED F-101
3	10/15/96	JT	AS-BUILT
2	1/22/96	JT	ISSUED FOR CONSTRUCTION
1	6/2/95	RAK	90% DESIGN SUBMITTAL
0	11/2/94	JT	30% DESIGN SUBMITTAL

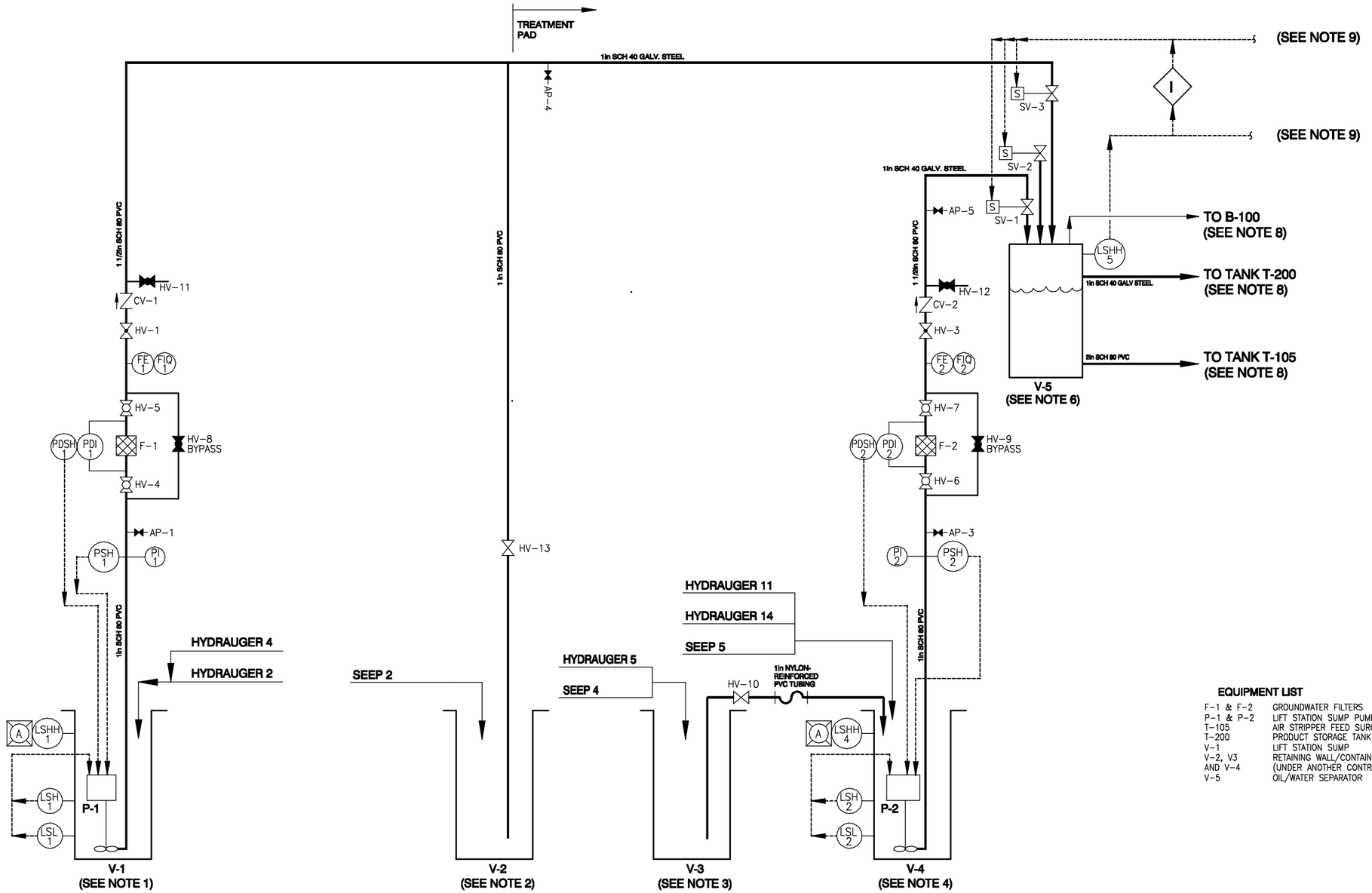
INTERNATIONAL TECHNOLOGY CORPORATION

DEFENSE ENERGY SUPPLY CENTER
DFSP, OZOL

700 CARQUINEZ SCENIC DR.
MARTINEZ, CALIFORNIA

PIPING AND INSTRUMENT DRAWING
TFGRS

DESIGNED BY: GREG SCOTT	DRAWN BY: ML	CHECKED BY: J. TULSKIE, PE
DATE: 11/2/94	FILE: X-2A_4	
PROJECT NO.: 830011194	CONTRACT:	
DRAWING: X-2A	REVISION: - 4	



EQUIPMENT LIST

F-1 & F-2	GROUNDWATER FILTERS
P-1 & P-2	LIFT STATION SUMP PUMPS
T-105	AIR STRIPPER FEED SURGE TANK
T-200	PRODUCT STORAGE TANK
V-1	LIFT STATION SUMP
V-2, V3 AND V-4	RETAINING WALL/CONTAINMENT SUMPS (UNDER ANOTHER CONTRACT)
V-5	OIL/WATER SEPARATOR

NOTES:

1. LIP OF LIFT STATION SUMP V-1 IS AT GROUND LEVEL AND GRAVITY FED BY 12in STEEL CULVERT (H2). V-1 WILL BE COVERED TO PREVENT INFLUX OF RAINWATER AND SURFACE RUNOFF.
2. V-2 IS PUMPED TO V-5 USING A PORTABLE PUMP IN V-2.
3. V-3 RETAINING WALL/CONTAINMENT SUMP IS GRAVITY FED FROM A 5in STEEL PIPE (H5) AND A SURFACE SEEP (S4).
4. SUMP IS GRAVITY FED FROM V-3, VIA A 12in STEEL CULVERT (H14), A 2in STEEL PIPE (H11) AND A SURFACE SEEP (S5).
5. (DELETED)
6. OIL/WATER SEPARATOR DESIGNED TO ACCEPT FLOWS UP TO 8 GPM. WATER GRAVITY DRAINS TO STORAGE TANK T-105. PRODUCT GRAVITY DRAINS TO STORAGE TANK T-200.
7. (DELETED)
8. THE AIR STRIPPER BLOWER (B-100), AIR STRIPPER FEED SURGE TANK (T-105) AND PRODUCT STORAGE TANK (T-200) ARE PART OF THE INTERCEPTOR TRENCH TREATMENT SYSTEM. SEE DRAWINGS X-1A & X-2A.
9. SEE OTHER SHUTDOWN INTERLOCKS FROM INTERCEPTOR TRENCH SYSTEM, SEE DRAWING X-2A.

NO.	DATE	BY	REVISION PURPOSE
4	2/20/02	JT	REV. V-2
3	10/15/96	JT	AS-BUILT
2	1/22/96	JT	ISSUED FOR CONSTRUCTION
1	5/25/95	RAK	90% DESIGN SUBMITTAL
0	2/17/95	RAK	30% DESIGN SUBMITTAL

INTERNATIONAL TECHNOLOGY CORPORATION

DEFENSE ENERGY SUPPLY CENTER DFSP OZOL

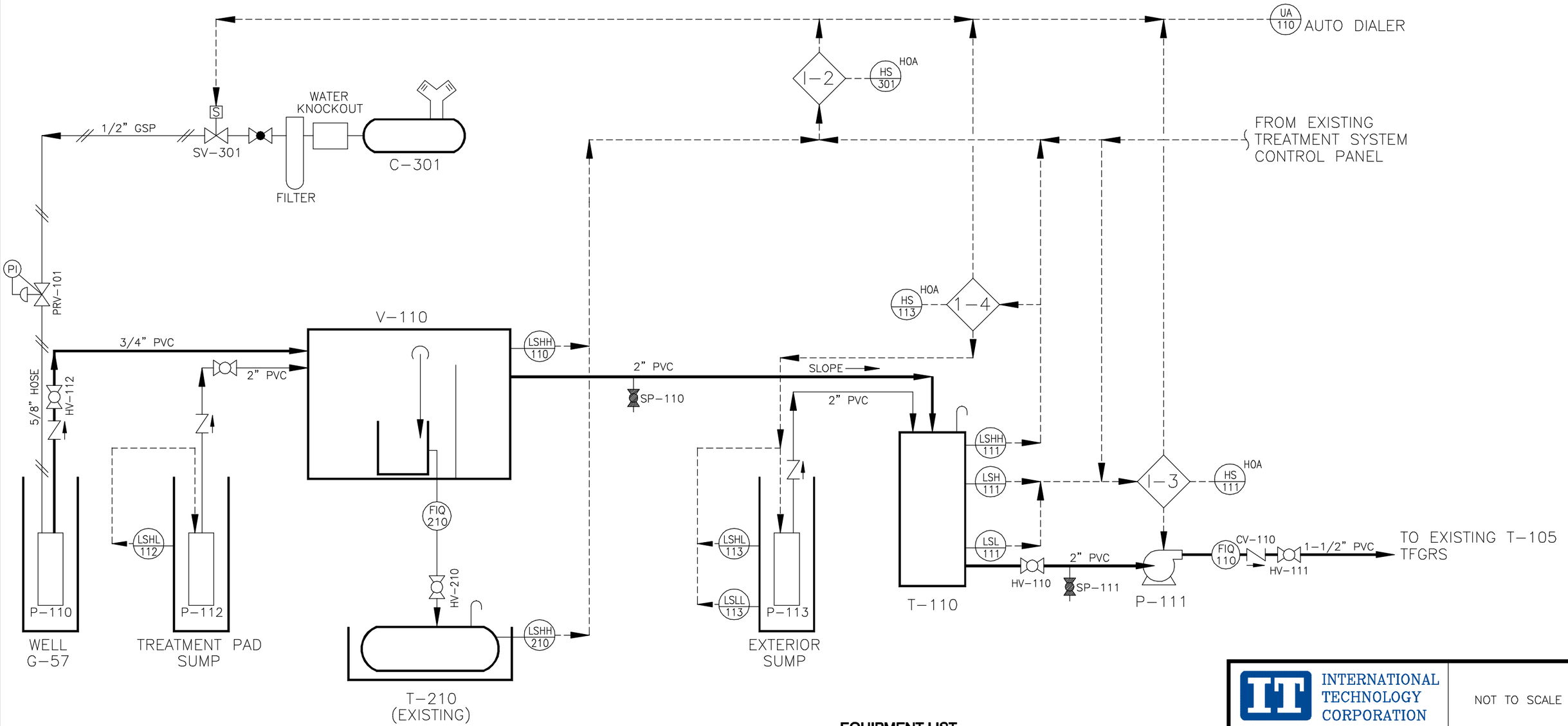
700 CARQUINEZ SCENIC DR.
MARTINEZ, CALIFORNIA

PIPING & INSTRUMENT DRAWING
TFGRS

DESIGNED BY:	DRAWN BY:	CHECKED BY:
G. ERICKSON	ML	R. KATIN, PE

DATE: 2/17/95	FILE: X-2B_4
PROJECT NO.: 830011194	CONTRACT:

DRAWING: X-2B REVISION: - 4



EQUIPMENT LIST

C-301	AIR COMPRESSOR
P-110	TOTAL FLUIDS PUMP
P-111	TRANSFER PUMP
P-112	TREATMENT PAD SUMP PUMP
P-113	EXTERIOR SUMP PUMP
T-110	TRANSFER TANK
T-210	PRODUCT STORAGE TANK
V-110	OIL/WATER SEPARATOR

INTERNATIONAL TECHNOLOGY CORPORATION

NOT TO SCALE

GENERATOR BUILDING SPH RECOVERY SYSTEM PIPING & INSTRUMENTATION DIAGRAM

CLIENT:	DEFENSE ENERGY SUPPLY CENTER DFSP OZOL
LOCATION:	700 CARQUINEZ SCENIC DR. MARTINEZ, CALIFORNIA
ACAD FILE:	X-2C_2
PROJECT NO.:	871194.1709
REV.:	2 (2/20/02)
DES.:	HS
DET.:	ML
DATE:	7/15/97
FIGURE:	X-2C
PM:	
PE/RG:	

ONE-LINE DIAGRAM SYMBOLS

- CIRCUIT AND EQUIPMENT INSTALLED BY THIS CONTRACT
- EQUIPMENT ENCLOSURE
- CONTROL OR INTERLOCK CIRCUIT
- CONNECTION
- MOLDED CASE CIRCUIT BREAKER
- FUSE
- FUSED DISCONNECT SWITCH
- FULL VOLTAGE, NON-REVERSING (FVNR) MAGNETIC MOTOR STARTER
- MANUAL MOTOR STARTER
- AS — AMMETER SWITCH
- VS — VOLTMETER SWITCH
- A — AMMETER
- V — VOLTMETER
- RECEPTACLE-CLASS I, DIVISION 1, GROUPS C, D
- FUSED POTENTIAL TRANSFORMERS
- CURRENT TRANSFORMER
- POWER TRANSFORMER
- LIGHTNING OR SURGE ARRESTER
- GROUND CONNECTION
- WH-M — WATT-HOUR METER SOCKET. METER FURNISHED BY UTILITY.
- 5 — MOTOR - NUMBER INDICATES HP

PLAN SYMBOLS

- NEW CONSTRUCTION
- EXISTING CONSTRUCTION
- EXISTING CONSTRUCTION TO BE REMOVED
- CONDUIT EXPOSED
- CONDUIT CONCEALED IN WALL CEILING OR HIDDEN FROM VIEW
- CONDUIT CONCEALED IN FLOOR OR UNDERGROUND
- FLEXIBLE CONDUIT (LIQUIDTIGHT)
- GROUND CABLE
- BOLTED GROUND CONNECTION
- WELDED GROUND CONNECTION
- G — GROUND ROD
- HOMERUN. ARROWHEADS INDICATE NUMBER OF CIRCUITS
- CONDUIT TURNING UP
- CONDUIT TURNING DOWN
- CONDUIT WITH BUSHING
- CONDUIT TERMINATED OR CAPPED
- POWER PANEL-480V, 3Ø
- LIGHTING PANEL-120/240V, 1Ø OR 208/120V, 3Ø
- DISCONNECT (SAFETY) SWITCH
- MS — MANUAL MOTOR STARTER
- MAGNETIC MOTOR STARTER
- COMBINATION MAGNETIC MOTOR STARTER
- 5 — MOTOR-NUMBER INDICATES HP
- P — PULLBOX
- J — JUNCTION BOX
- EXIT LIGHT
- L-1 — FLUORESCENT LUMINAIRE TYPE L-1
- L-1 L-1 — INCANDESCENT OR H.I.D. LUMINAIRE TYPE L-1
- EMERGENCY LIGHTING UNIT
- EMERGENCY FLUORESCENT LIGHTING FIXTURE
- DUPLEX RECEPTACLE WP-WEATHERPROOF GFCI-GROUND FAULT CIRCUIT INTERRUPTER
- RECEPTACLE-CLASS I, DIVISION 1, GROUPS C, D
- T — THERMOSTAT
- S — SINGLE POLE SWITCH
- S 3 — THREE-WAY SWITCH
- S 4 — FOUR-WAY SWITCH

SCHEMATIC DIAGRAM SYMBOLS

- TERMINAL
- CONDUCTOR CONNECTION
- NO CONNECTION
- GROUND
- CONTACT NORMALLY OPEN (NO)
- CONTACT NORMALLY CLOSED (NC)
- SWITCH
- SELECTOR SWITCH
- PUSHBUTTON-NORMALLY OPEN MOMENTARY
- PUSHBUTTON-NORMALLY CLOSED MOMENTARY
- PRESSURE OR VACUUM SWITCH-CLOSES WITH INCREASING PRESSURE OR DECREASING VACUUM
- PRESSURE OR VACUUM SWITCH-OPENS WITH INCREASING PRESSURE OR DECREASING VACUUM
- LIMIT SWITCH NO
- LIMIT SWITCH NO-HELD CLOSED
- LIMIT SWITCH NC
- LIMIT SWITCH NC-HELD OPEN
- NO TIME DELAY CONTACT. TIME DELAY CLOSING AFTER ENERGIZATION
- NC TIME DELAY CONTACT. TIME DELAY OPENING AFTER ENERGIZATION
- NO TIME DELAY CONTACT. TIME DELAY OPENING AFTER DE-ENERGIZATION
- NC TIME DELAY CONTACT. TIME DELAY CLOSING AFTER DE-ENERGIZATION
- M — MOTOR STARTER COIL
- RELAY COIL
- G — INDICATING LIGHT-COLOR INDICATED

A-AMBER	R-RED
BL-BLUE	Y-YELLOW
G-GREEN	W-WHITE

- FLOW SWITCH-OPENS WITH INCREASING FLOW
- FLOW SWITCH-CLOSES WITH INCREASING FLOW
- LIQUID LEVEL SWITCH-CLOSES ON RISING LEVEL
- LIQUID LEVEL SWITCH-OPENS ON RISING LEVEL
- TEMPERATURE SWITCH-CLOSES ON RISING TEMPERATURES
- TEMPERATURE SWITCH-OPENS ON RISING TEMPERATURES
- SOLENOID VALVE COIL
- 3 OL — THERMAL OVERLOAD RELAY CONTACT NUMBER INDICATES NUMBER OF CONTACTS
- FUSE
- CONTROL POWER TRANSFORMER (CPT)
- H — HORN
- B — BELL

GENERAL ABBREVIATIONS

A, AUTO	AUTOMATIC	H	HAND	PLC	PROGRAMMABLE LOGIC CONTROLLER
ACK	ACKNOWLEDGE	HI	HIGH	REM	REMOTE
AFF	ABOVE FINISH FLOOR	HS	HIGH SPEED	REV	REVERSE
AFG	ABOVE FINISH GRADE	IL	INDICATING LIGHT	SOL	SOLENOID (OTHER THAN VALVE)
BC	BARE COPPER	INST	INSTANTANEOUS	SP	SPARE
C	CONDUIT	L	LOW	SS	SELECTOR SWITCH
CB	CIRCUIT BREAKER	LOC	LOCAL	SV	SOLENOID VALVE
CL	CLOSE	LS	LOW SPEED	T, T-STAT	THERMOSTAT
CPT	CONTROL POWER TRANSFORMER	MAN	MANUAL	TDAE	TIME DELAY AFTER ENERGIZATION
CR	CONTROL RELAY	MCC	MOTOR CONTROL CENTER	TDAD	TIME DELAY AFTER DE-ENERGIZATION
CS	CONTROL SWITCH	NC	NORMALLY CLOSED	TDR	TIME DELAY RELAY
CT	CURRENT TRANSFORMER	NL	NIGHT LIGHT (UNSWITCHED FIXTURE)	TEMP	TEMPERATURE
DWG	DRAWING	NO	NORMALLY OPEN	TMR	TIMER
ETM	ELAPSED TIME METER	O	OFF	WP	WEATHERPROOF
FU	FUSE	OL	THERMAL OVERLOAD RELAY	XFMR	TRANSFORMER
FWD	FORWARD	OP	OPEN	XP	EXPLOSIONPROOF-CLASS I, DIVISION I, GROUPS C, D
GND	GROUND	PB	PUSHBUTTON		

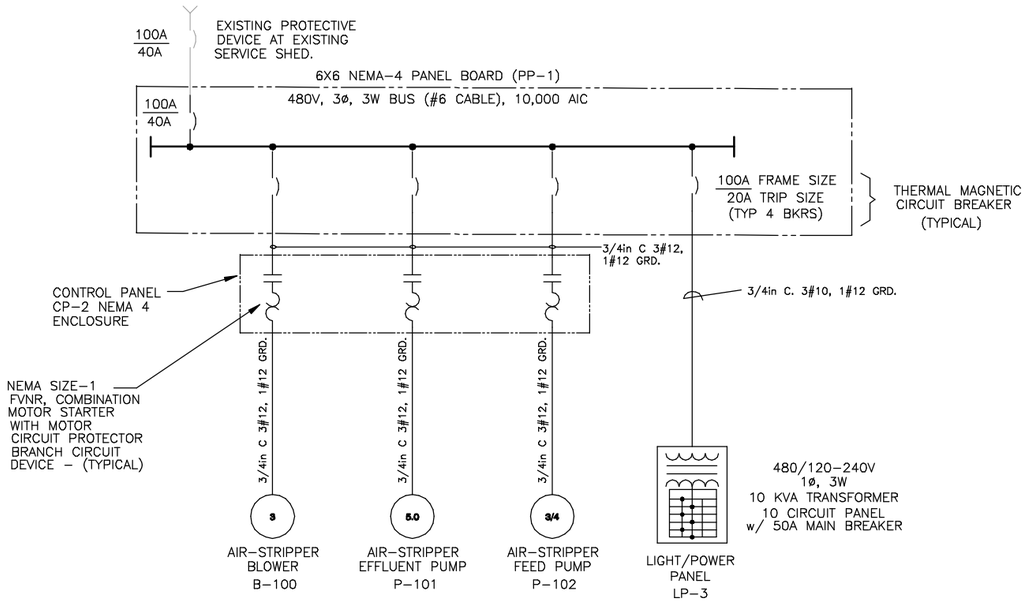
NO.	DATE	BY	REVISION PURPOSE
1	2/20/02	JT	REV. TITLE

INTERNATIONAL TECHNOLOGY CORPORATION

DEFENSE ENERGY SUPPLY CENTER
DFSP OZOL
700 CARQUINEZ SCENIC DR.
MARTINEZ, CALIFORNIA

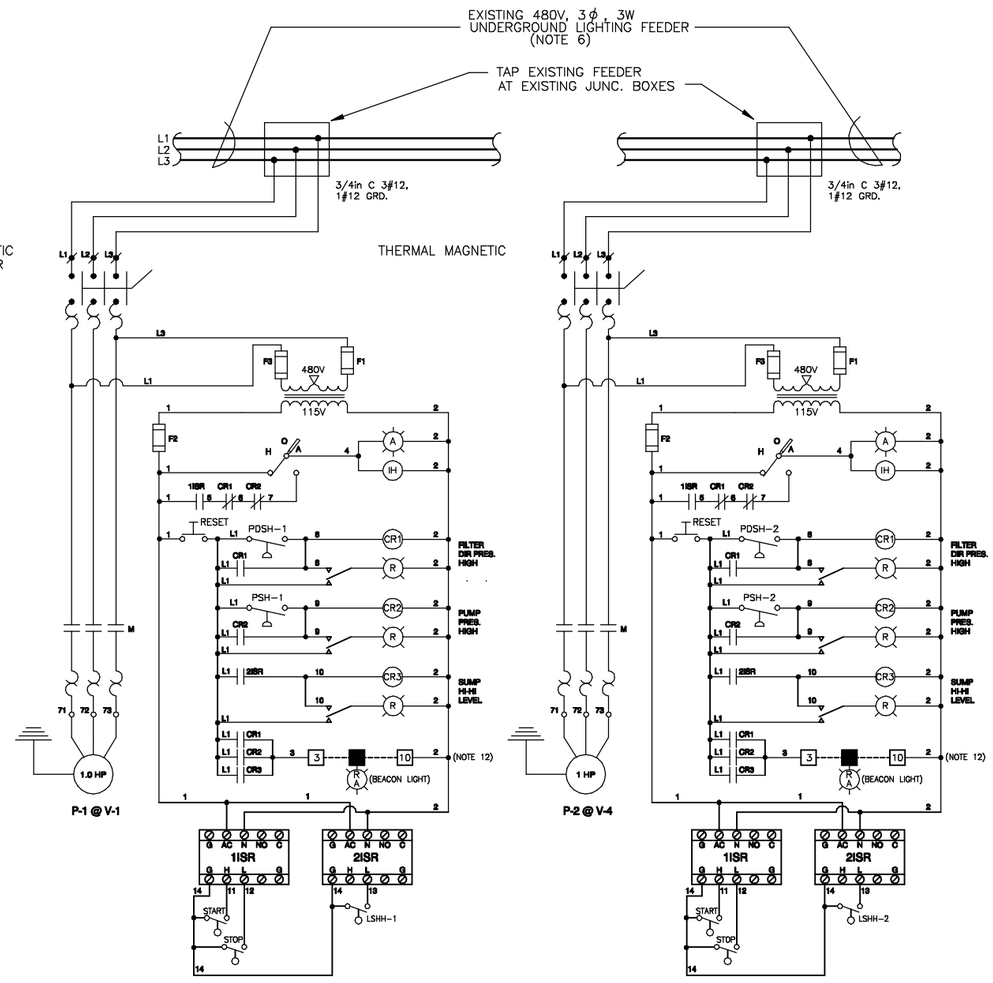
ELECTRICAL LEGEND

DESIGNED BY:	DRAWN BY:	CHECKED BY:
DATE: 9/16/94		FILE: E-0_1
PROJECT NO.: 830011194		CONTRACT:
DRAWING: E-0		REVISION: - 1

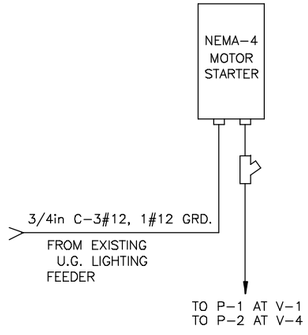


ELECTRICAL ONE-LINE DIAGRAM
(REMEDIATION EQUIPMENT AREA)

PANEL NO.- LP-3		BUS RATING- 100A			MAIN BKR.- 50A		
VOLTAGE- 240/120V.		PHASE- 1 PH			SWITCH RACK- N/A		
LOCATION- TREATMENT PAD					FED FROM PP-1		
REF. DWG- NONE					10,000 AIC		
DESCRIPTION	LOAD VA	BKR SIZE	CKT NO.	PHASE A H / B N	CKT NO.	BKR SIZE	LOAD VA	DESCRIPTION
MAIN CONTROL PANEL	750	20A 1P	1		2	20A	100	TEL. DIALER
SPARE	-		3		4		400	PAD RECPTS.
P-104	200	20A 2P	5		6			SPARE
					8			SPARE
P-100/P-200	1250	20A 2P	9		10			SPARE
SUBTOTAL	2200						500	SUBTOTAL
							2700	TOTAL PANEL LOAD



ELECTRICAL ONE-LINE DIAGRAM
(SEEP/HYDRAUGER COLLECTION SUMPS AT V-1 & V-4, NOTE 13)



ELECTRICAL POWER ELEVATION-TYP. FOR 2
(SEEP/HYDRAUGER SUMPS V-1, V-4)
(N.T.S.)

NOTE:

PROVIDE SUITABLE SUPPORTS FOR MOTOR STARTER.

NOTES:

1. ALL ELECTRICAL EQUIPMENT SHALL BE SUITABLE FOR THE AREA CLASSIFICATION.
2. ALL ELECTRICAL EQUIPMENT SHALL BE PROPERLY GROUNDED.
3. ALL WIRE SHALL BE RATED 600V. TYPE THHN.
4. MINIMUM SHORT CIRCUIT CAPACITY FOR ALL EQUIMENT SHALL BE 14,000 AMPS.
5. MOTOR CONTROL POWER SHALL BE FURNISHED VIA CONTROL POWER TRANSFORMER FURNISHED WITH STARTERS.
6. FIELD TO DETERMINE IF EXISTING LIGHTING FEEDER IS ADAQUATELY SIZED TO ACCOMODATE ADDITIONAL LOAD & REMOVE EXISTING PHOTOCELL ON LIGHTING CIRCUIT & INSTALL INDIVIDUAL PHOTOCELLES ON EACH OF APPROX. 8-9 LIGHTS.
7. COLLECTION SUMPS V-2 AND V-3 LEVEL CONTROLS SELF CONTAINED, NO POWER REQUIRED-CONTROL WIRING ONLY.
8. THE USE OF THE EXISTING BASE LIGHTING SYSTEM WILL NEED TO BE INVESTIGATED FOR POWER QUALITY. USE OF THE OLDER LOW POWER FACTOR TYPE HID BALLAST WILL PRESENT A LARGE COMPONENT OF NON-LINEAR LOADS WITH RESPECT TO THE LINEAR MOTOR LOADS. THIS SHOULD BE SURVEYED IN THE FIELD PRIOR TO THE START OF WORK. A THD OF LESS THAN 4% PER IEE 519-1993 SHOULD BE CONFIRMED AT EACH POWER CONNECTION POINT.
9. ALL OUTDOOR EQUIPMENT IS NEMA 4.
10. ALL FUSES ARE BUSSMAN OR EQUAL.
11. SEAL-OFFS SHALL BE INSTALLED ON ALL CONDUITS ENTERING CLASS 1, DIVISION 1 AND 2, GROUP D AREAS.
12. INSTALL ALARM LIGHTS AT CLOSEST EXISTING LIGHT POLE VISIBLE FROM ROAD.
13. WIRING DIAGRAM COPIED FROM ONE SUPPLIED BY BARNES PUMPS.

NO.	DATE	BY	REVISION PURPOSE
3	2/20/02	JT	REV. P-1, P-101
2	10/15/98	JT	AS-BUILT
1	1/22/98	JT	ISSUED FOR CONSTRUCTION
0	6/8/95	RI	FOR CLIENT REVIEW

INTERNATIONAL TECHNOLOGY CORPORATION

DEFENSE ENERGY SUPPLY CENTER DFSP OZOL

700 CARQUINEZ SCENIC DR.
MARTINEZ, CALIFORNIA

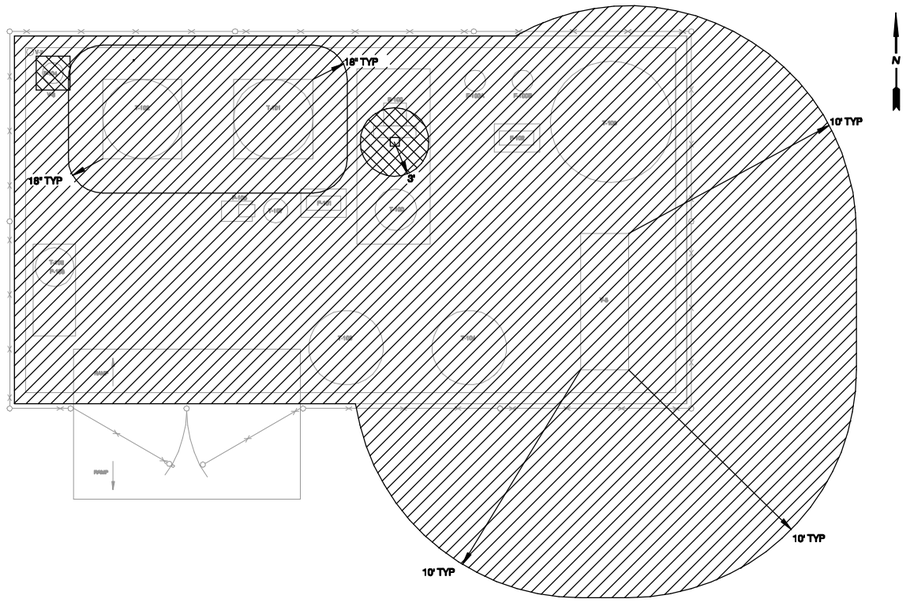
ELECTRICAL ONE-LINE DIAGRAM TFGRS

DESIGNED BY:	DRAWN BY:	CHECKED BY:
JOE HABISH, PE	ML	R. ISERMAN, PE

DATE:	FILE:
6/6/95	E-1_3

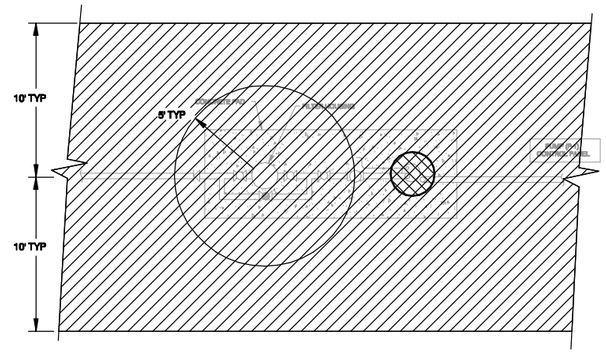
PROJECT NO.:	CONTRACT:
830011194	

DRAWING: E-1 REVISION: - 3

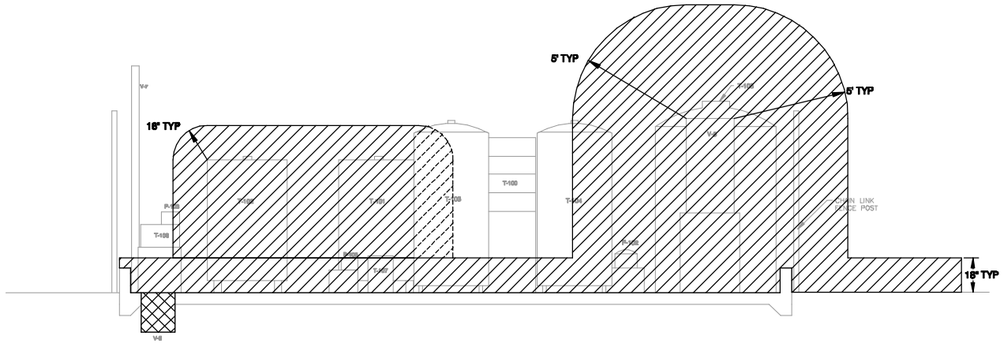


PLAN VIEW

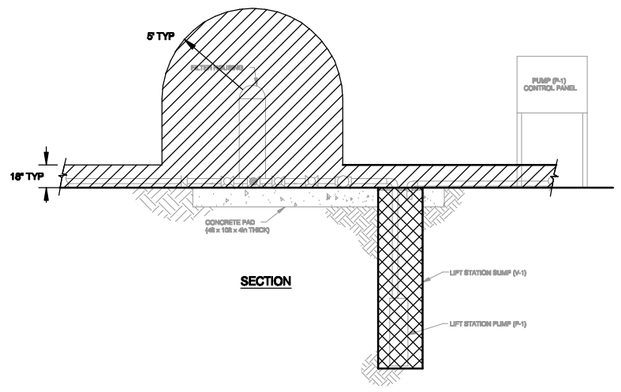
SCALE 0 2 4 FEET



PLAN



ELEVATION



V-1 & V-4 LIFT STATION SUMP

SCALE: NONE

EQUIPMENT LIST

B–100	AIR STRIPPER BLOWER
F–F100A/F–100B	AIR STRIPPER FEED FILTERS
P–100	GW EXTRACTION PUMP
P–101	AIR STRIPPER EFFLUENT PUMP
P–102	AIR STRIPPER FEED PUMP
P–103	ACID INJECTION PUMP
P–104	SUMP PUMP
P–105	DEFOAMER INJECTION PUMP
P–200	PRODUCT SKIMMING PUMP
T–100	AIR STRIPPER
T–101/T–102	VAPOR PHASE GAC BEDS
T–103/T–104	LIQUID PHASE GAC BEDS
T–105	FEED SURGE TANK
T–106	ACID STORAGE TANK
T–107	DEFOAMER STORAGE TANK
V–5	OIL/WATER SEPARATOR
V–6	SECONDARY CONTAINMENT
V–7	STACK

LEGEND

CHAIN LINK FENCE

CLASS I, DIV. 2 HAZARDOUS AREA

CLASS I, DIV. 1 HAZARDOUS AREA

NOTES

1. ALL ELECTRICAL EQUIPMENT IN HAZARDOUS AREAS SHALL BE APPROVED FOR USE IN SUCH AREAS.

NO.	DATE	BY	REVISION PURPOSE
3	2/20/02	JT	REV. TITLE
2	10/15/96	JT	AS-BUILT
1	1/22/96	JT	ISSUED FOR CONSTRUCTION
0	6/13/95	RI	FOR CLIENT REVIEW

INTERNATIONAL TECHNOLOGY CORPORATION

DEFENSE ENERGY SUPPLY CENTER DFSP OZOL

700 CARQUINEZ SCENIC DR.
MARTINEZ, CALIFORNIA

AREA CLASSIFICATION TREATMENT EQUIPMENT PAD & SEEP/HYDRAUGER COLLECTION SYSTEM SUMPS

DESIGNED BY:	DRAWN BY:	CHECKED BY:
J. HABISH, PE	ML	R. ISERMAN, PE

DATE:	FILE:
6/13/95	E-2_3

PROJECT NO.:	CONTRACT:
830011194	

DRAWING: E-2 REVISION: - 3

N

0 60 120
SCALE FEET

LEGEND

- NEW ABOVEGROUND CONDUIT (NOTE 6)
- EXISTING U/G CONDUIT
- V-4 COLLECTION SUMP (NOT SHOWN TO SCALE)
- FENCE (EXISTING)
- H3 HYDRAUGER PIPE DAYLIGHT LOCATION

NOTES:

1. (DELETED)
2. ENERGIZE HYDRAUGER AND SEEP WATER COLLECTION SYSTEM FROM EXISTING 480V/3ø/3C FENCE LIGHTING CIRCUIT.
3. POWER SUPPLY FOR EXISTING SERVICE IN SHED.
4. REMEDIATION EQUIPMENT SITE (LOCATION OF V-5, T-100, T-105, & T-200).
5. BURY ELEC. CONDUIT WITH GROUNDWATER CONVEYANCE TUBING UNDER GRAVEL ACCESS ROAD.
6. ABOVEGROUND CONDUIT SHALL BE RIGID METALLIC AND SUPPORTED WITH GROUNDWATER CONVEYANCE TUBING AS SHOWN ON DRAWING P-3A, DETAIL 1.
7. (DELETED)
8. (DELETED)
9. ALARM LIGHTS TO BE MOUNTED ON EXISTING LIGHT POLE VISIBLE FROM ROAD.

NO.	DATE	BY	REVISION PURPOSE
4	2/20/02	JT	REV. TITLE
3	10/15/98	JT	AS-BUILT
2	1/22/98	JT	ISSUED FOR CONSTRUCTION
1	5/26/95	RAK	90% DESIGN SUBMITTAL
0	2/171/95	RAK	30% DESIGN SUBMITTAL

INTERNATIONAL TECHNOLOGY CORPORATION

DEFENSE ENERGY SUPPLY CENTER DFSP OZOL

700 CARQUINEZ SCENIC DR.
MARTINEZ, CALIFORNIA

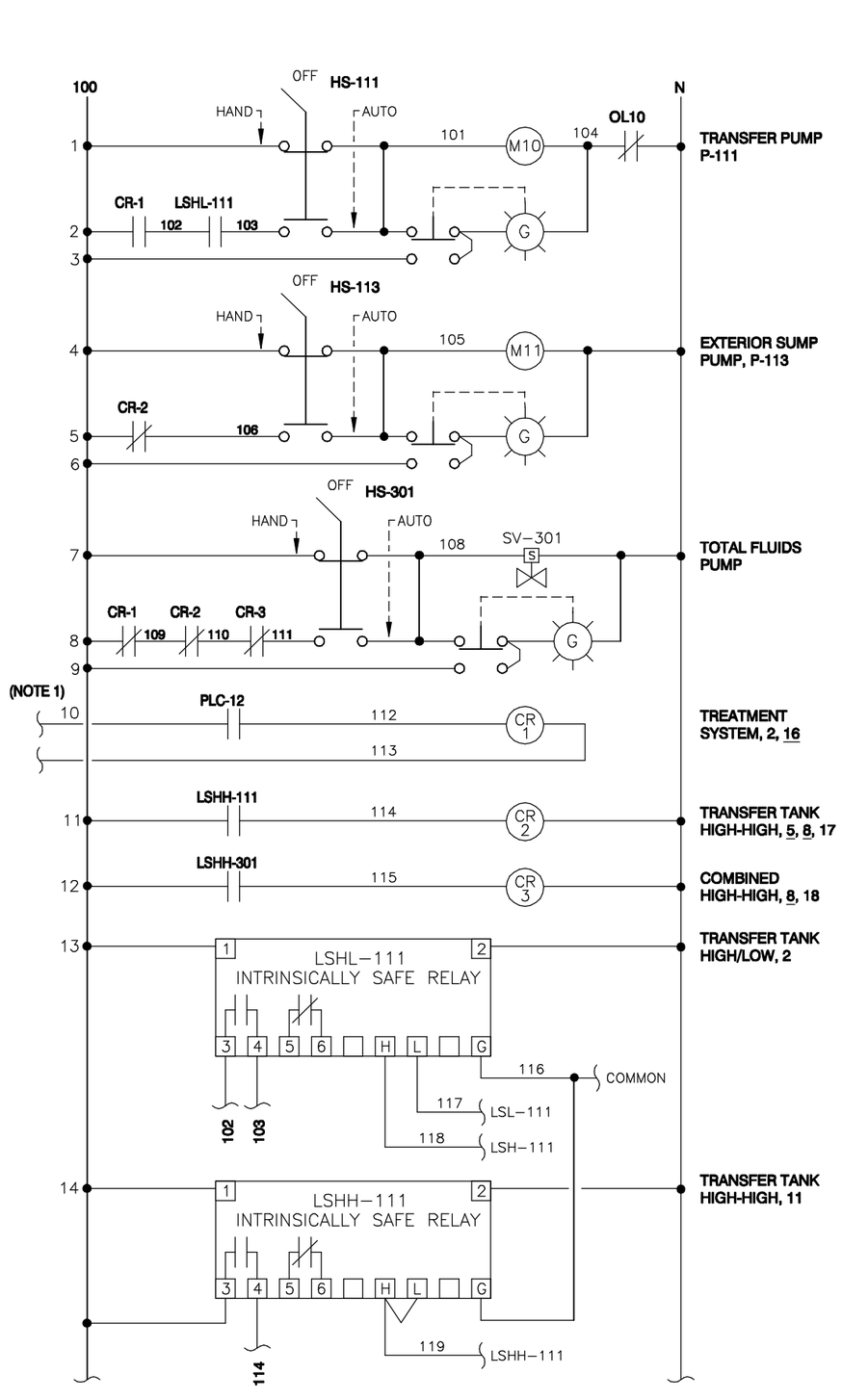
ELECTRICAL CONDUIT PLAN TFGRS

DESIGNED BY:	DRAWN BY:	CHECKED BY:
J. CARIGLIA	ML	R. ISERMAN, PE

DATE:	FILE:
2/17/95	E3_4

PROJECT NO.:	CONTRACT:
830011194	

DRAWING: E-3 REVISION: - 4



NOTES:

1. FROM HOT 120 VAC COMMON AT PLC AT EXISTING INTERCEPTOR TRENCH TREATMENT SYSTEM.
2. MOTOR STARTER AND PRESSURE SWITCH FOR COMPRESSOR C-301 CONTROL SUPPLIED WITH COMPRESSOR.
3. LEVEL SWITCHES LSHL-112 & LSHL-113 FOR STARTING/STOPPING P-112 & P-113 RESPECTIVELY.

INTERNATIONAL TECHNOLOGY CORPORATION

NOT TO SCALE

480-VOLT ELECTRICAL ONE LINE, CONTROL SCHEMATIC

CLIENT:	DEFENSE ENERGY SUPPLY CENTER DFSP OZOL
LOCATION:	700 CARQUINEZ SCENIC DR. MARTINEZ, CALIFORNIA
ACAD FILE: E-4_2	PROJECT NO.: 871194.1702
REV.: 2 (2/20/02)	
DES.: MCS / DET.: ML / DATE: 11/1/96	FIGURE: E-4
PM:	PE/RG:

9. Attached is the synopsis of the Operations and Maintenance Plan for DFSP San Pedro to be used in proposing costs for CLINs 0013B and 0014B.

DRAFT
OPERATION & MAINTENANCE MANUAL
2002 UPDATE
PUMP HOUSE AREA REMEDIATION SYSTEM
DEFENSE FUEL SUPPLY POINT SAN PEDRO
CONTRACT #SPO600-98-5839
TASK ORDER ACO-024
SAN PEDRO, CALIFORNIA

GROUNDWATER TECHNOLOGY, INC.
A WHOLLY OWNED SUBSIDIARY OF IT CORPORATION
PROJECT # 803220

PREPARED FOR

DEFENSE ENERGY SUPPORT CENTER
8725 JOHN J. KINGMAN ROAD, SUITE 2833
FORT BELVOIR, VIRGINIA 22060-6222

MAY 9, 2002

DRAFT
OPERATION & MAINTENANCE MANUAL
2002 UPDATE
PUMP HOUSE AREA REMEDIATION SYSTEM
DEFENSE FUEL SUPPLY POINT SAN PEDRO
CONTRACT #SPO600-98-5839
TASK ORDER ACO-024
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PREPARED FOR

DEFENSE ENERGY SUPPORT CENTER
8725 JOHN J. KINGMAN ROAD, SUITE 2833
FORT BELVOIR, VIRGINIA 22060-6222

MAY 9, 2002

Groundwater Technology, Inc.
Approved by:

_____	_____
Charles Campbell, PE	Jay Neuhaus
Project Engineer	Project Manager

Table of Contents

Table of Contents (continued)

Table of Contents (continued)

Table of Contents (continued)

List of Tables

List of Figures

List of Appendices

Note: These appendices include new, additional, or updated information which was not included in the orginal O&M Manual issued in 1997.

List of Appendices (continued)

1.0 Introduction

This operation and maintenance (O&M) manual update (hereinafter referred to as the "2002 O&M Manual Update") is intended the describe upgrades and modifications to operation and maintenance of the Defense Fuel Support Point (DFSP) San Pedro pump house area remediation system. This document is not comprehensive and should serve as a supplement to the *Operation and Maintenance Manual Pump House Area Remediation System* prepared by Groundwater Technology Government Services Inc., in 1997 (hereinafter referred to as the "O&M Manual"). The system is designed to remove petroleum hydrocarbons from the soil and groundwater underlying the pump house area of the site. Previous site investigations had led to the discovery of adsorbed-phase, dissolved-phase and liquid-phase hydrocarbons present in the subsurface soils and groundwater. The remediation system consists of free-product recovery, bioventing, and vapor extraction wells. The site is divided into two functional areas, 1) the south pump house area, which includes the limits of the original system installed in 1995, and 2) the north pump house area, which includes the expansion of the remediation system that occurred during 1999 and 2000.

The system was originally designed and installed at the DFSP in San Pedro, California, for the Defense Energy Supply Center (DESC) under contract DLA600-92-C-5243, Task Order ACO-0013. The system was expanded and modified under DESC contract SPO600-98-5839.

1.1 Purpose

This 2002 O&M Manual Update and the O&M Manual are the guiding document for the bioventing and free product/vapor extraction treatment systems installed at the DFSP San Pedro facility. The O&M Manual and the 2002 O&M Manual Update include information pertaining to the operation and maintenance of the treatment facility equipment and systems, regulatory and permitting requirements, performance monitoring, health and safety procedures, and waste handling. The documents are supplemented with equipment manufacturer O&M manuals, catalogs, cut sheets, and other technical data that provide information pertinent for operating, maintaining, and troubleshooting individual equipment components and systems.

1.2 Organization of the 2002 O&M Manual Update

To provide the background, technical basis, procedures, and administrative requirements necessary to operate and maintain the treatment facility, this document retains the organization of the O&M Manual and therefore is organized into the following sections:

- ***Section 1.0, Introduction,*** provides a general introduction of the project, O&M Manual, 2002 O&M Manual Update, site history, and remediation design and update requirements.
- ***Section 2.0, Regulatory Requirements and Permits,*** summarizes the regulatory basis for performing the project and provides the treated groundwater and treated soil vapor permits to discharge required for system operation.
- ***Section 3.0, Process and Equipment Descriptions,*** describes additions and modifications to the remediation equipment and systems.
- ***Section 4.0, Operation and Control Procedures,*** provides the procedures used to start up, operate, and shutdown the various equipment and systems.
- ***Section 5.0, Maintenance and Troubleshooting,*** includes manufacturer recommendations for maintaining the major equipment and procedures for troubleshooting and diagnosing failures.
- ***Section 6.0, Performance Monitoring,*** contains the operating parameters used to monitor system performance and the sampling and analysis needed to ensure effluent waste streams meet permit requirements.
- ***Section 7.0, Housekeeping and Waste Handling,*** outlines housekeeping and general upkeep requirements for the facility and requirements for storing, marking, transporting, disposing, and documenting of all liquid and solid wastes. **Note: no modifications apply to this section. The text of this section can be found in the original O&M Manual.**
- ***Section 8.0, Training,*** provides direction on required OSHA, health and safety, and equipment training documentation. **Note: no modifications apply to this section. The text of this section can be found in the original O&M Manual.**
- ***Section 9.0, Record keeping,*** provides direction on documentation of operation, maintenance, and waste disposal activities for the treatment facility.
- ***Section 10.0, Operation Safety Manual,*** provides the necessary health and safety guidelines for operation of the treatment system as a supplement to the existing Site Health and Safety Plan. **Note: Revision to this section is beyond the scope of this 2002 O&M Manual Update.**
- ***Appendices*** contain the As-Built drawings, operations log sheets, manufacturer technical information, and permits.

1.3 Site Description

The DFSP San Perdo facility, occupying approximately 331 acres near the harbor district of Los Angeles, California, was constructed in 1943 for the storage of fuels for the Navy. The facility was operated by the Navy until 1980, when it was transferred to the Defense Logistics Agency. The property is bounded by North Gaffey Street to the east, Western Avenue to the west, Palos Verdes Drive North to the north, and a residential area to the south. The facility serves as a fuel storage and transfer facility.

Fuels stored and distributed at the facility have changed over the years. The following is a summary of the types of fuels stored and the approximate amount of time they were present at the site (Clarence Wilson, personal communication, January 27, 1993):

Diesel Series	
Bunker Fuel	1940s to early 1960s
Navy Special	Early 1960s to mid 1970s
Navy Distillate	Mid to late 1970s
Diesel Fuel Marine	Late 1970s to present

Jet Fuel Series	
Aviation Gas (AVGAS)	1940s to late 1950s
JP-4	1958 to 1993
JP-5	1958 to present
JP-8	1993 to present

The site currently contains 30 underground and 10 aboveground tanks, distributed throughout the facility. Tanks at the facility are primarily used to store jet propellant Nos. 5 and 8 (JP-5 and JP-8), and diesel marine fuel. Other materials stored at the facility include fuel system icing inhibitor, JP-5 chemical additives, and waste product. Fuel is transferred to and from the facility primarily through a series of underground pipelines and, to a lesser degree, via tanker trucks.

The area where the remediation system has been constructed is located in the pump house area in the southeast corner of the site (Figure 1). The pump house area is in a cleared, relatively level area and occupies approximately 15 acres. There are seven pump houses and twelve valve pits located in the area for the on-site and off-site distribution of fuels. Fuels are transported via underground pipelines. A surface release of approximately 100,000 gallons of diesel fuel occurred in March 1979. Approximately 62,000 gallons of fuel

reportedly were recovered at that time, but some fuel leaked into underlying soil and groundwater.

1.4 Remediation System Design Modifications

The pump house area site plan is presented in Drawing G-001.

The south pump house area includes 15 active bioventing wells and seven active converted vapor extraction wells, which were total fluids extraction wells until 1998 when they were shut down due to low product recovery rates.

In 1999 the remediation system was expanded to the northern portion of the pump house area. The system expansion included the installation of six additional total fluids extraction wells, ten combination biovent/vapor extraction wells, and both above-grade and below grade process piping from the remediation system compound to these wells. Also, at this time piping and controls were installed to allow use of the treated water for irrigation of the phytoremediation trees located in the central pump house area.

In 2000 the remediation system was again expanded to the western side of the north and central pump house area. This expansion included in the installation of four additional total fluids recovery wells and eight new biovent wells.

Drawing G-002 presents a detailed site plan of the north and central pump house area.

Additional detail regarding the installation of recovery and bioventing wells is presented in the Field Investigation, System Installation, and Start-up Report, which is being prepared concurrent to this 2002 O&M Manual Update.

Also during 2000 and 2001 the system instrumentation and controls were modified to improve the overall performance, safety, and monitoring. The programmable logic controller (PLC) program was extensively revised and remote system monitoring was implemented.

In early 2002 product skimming was implemented at well WCW-8 using a pneumatic skimming pump. Compressed air to operate the pump has been obtained by tapping into the compressed air line extending from the treatment compound to the north pump house area. The pump controller is mounted on a trailer, which also holds two 200-gallon product storage tanks. The recovered product from WCW-8 is pumped into the trailer mounted tanks, which contain a high-level switch that interlocks with a solenoid valve to shut down the air supply when the tanks are full. The tanks are emptied using a vacuum truck.

1.5 O&M Manual Updates

The O&M manual is organized to support system operation and facilitate equipment troubleshooting and repairs. The design basis for each component is discussed, and information provided by equipment vendors is included. Information for the system as configured at the time of compilation of this update has been incorporated into this 2002 O&M Manual Update. Because process equipment may be further upgraded or system operation expanded and/or improved, future updates may be required.

2.0 Permits

2.1 Applicable Regulations

Regulations applicable to the operation and maintenance of the treatment system include the State Clean Air Act regulations and the State Waste Discharge Permit Program regulations. The Clean Air Act regulations apply to air emissions from the treatment system and are administered by the South Coast Air Quality Management District (SCAQMD). The wastewater discharge regulations apply to the discharge of treated effluent to a local storm water drain and are administered by the California Regional Water Quality Control Board (CRWQCB), Los Angeles Region.

2.2 Regulatory Requirements

The treatment system operates under two regulatory permits: Permit to Construct/Operate, which establishes limits on air emissions, and a General National Pollutant Discharge Elimination System (NPDES) permit, which places limits on the quantity and quality of effluent water discharged to the storm drain. These regulatory requirements are discussed separately below.

2.2.1 Permit to Construct/Operate

The SCAQMD Permit to Construct/Operate (No. D92550) was issued to the DFSC on August 4, 1995 (Appendix E). DESC directly handles permits renewals payments for this permit. The permit allows installation and operation of the vapor/groundwater extraction system subject to the conditions specified therein. Any system modifications that may alter the quantity or quality of air emissions must receive prior approval from SCAQMD.

Plans for system performance and compliance monitoring are detailed in Section 6.0.

2.2.2 NPDES Permit

The treatment system effluent water is discharged directly to a local storm water drain via a concrete- lined drainage system and, ultimately to the southwest slip of Los Angeles Harbor. NPDES Permit No. CAG834001 was issued July 24, 1995 (under CRWQCB Order No. 92-091) for the treatment system, in response to the DFSC application dated May 10, 1995. The NPDES permit required the implementation of Monitoring and Reporting Program No. CI 7565. The NPDES sampling and reporting requirements were modified in 1997 to

reduce the effluent sampling frequency from weekly to monthly (CRWQCB letter to Lt. Col. Charles Gross, Defense Fuel Region West dated March 3, 1997) (Appendix E).

In 1998 the CRWQCB issued new Order No. 97-046, which revised the NPDES Permit No. CAG834001. In November 2001, the CRWQCB requested Monitoring and Reporting Program CI No. 7565 be continued with the condition that MTBE analysis be included with the monthly effluent sampling. The CRWQCB also waived the requirement for phenolic and phenolic compounds analyses in the annual effluent sampling (telephone conversation with Raul Medina of the CRWQCB on November 8, 2001) (Appendix E).

Requirements for the treated water discharge are set forth in the NPDES permit Waste Discharge Requirements (Appendix E). The treatment system includes remediation equipment, which reduce effluent concentrations below the maximum allowed limits. The system is equipped with analysis ports to monitor performance and compliance with the permitted discharge limits. Plans for system performance and compliance monitoring are detailed in Section 6.0.

2.3 DESC and Regulatory Contacts

The primary DESC and regulatory contacts are provided below:

Hassan Dogrul
Defense Fuel Support Center
8725 John Kingman Drive, Suite 2833
Fort Belvoir, VA 22060-6222
(703) 767-8308

Joe Traini
Defense Fuel Support Point San Pedro
3171 N. Gaffey Street
San Pedro, CA 90731
(310) 900-6960 ext. 1106

Jeffery Hu
Site Cleanup Unit
California Regional Water Quality Control Board, Los Angeles Region
320 West 4th Street, Suite 200
Los Angeles, CA 90013

Raul Medina
Permitting Unit
California Regional Water Quality Control Board, Los Angeles Region
320 West 4th Street, Suite 200
Los Angeles, CA 90013

3.0 Process and Equipment Descriptions

The overall objective of the remediation system is to remove adsorbed and liquid-phase petroleum hydrocarbons underlying the pump house area of the DFSP San Pedro facility. Adsorbed petroleum hydrocarbons are removed from the vadose-zone through the injection of fresh air into the subsurface to promote aerobic biodegradation. Simultaneously, a negative pressure is applied through soil vapor extraction (SVE) to promote vapor flow thereby improving the movement of air through the vadose-zone hydrocarbon plume. Liquid-phase hydrocarbons are removed by creating a cone of depression at well points within the floating free-phase hydrocarbon plume to enhance free-phase hydrocarbon extraction rates. The waste streams (water and air) are appropriately treated prior to permitted discharge of clean effluent streams. Drawing X-001 illustrates the various process flowpaths. Process treatment systems are utilized to:

- aerate subsurface contaminants to increase biodegradation and extract contaminated vapors
- extract contaminated groundwater and free product
- separate aqueous and non-aqueous phase liquids
- remove dissolved volatile organic compounds (VOCs) through liquid phase granular activated carbon (LGAC) treatment
- remove vapor stream VOCs through vapor phase granular activated carbon (VGAC) treatment
- store recovered product for subsequent recycling or disposal

PROCESS TREATMENT SYSTEMS	
SYSTEM No.	TITLE
1	Bioventing
2	Groundwater and Product Recovery
3	Vapor Extraction and Treatment

Process support systems are used to:

- provide compressed air for the total fluid recovery pumps
- provide 480 volt and 240/120 volt electrical power for equipment and lighting
- control overall system operation via a Programmable Logic Controller (PLC).

SUPPORT SYSTEMS	
SYSTEM No.	TITLE
1	Compressed Air
2	Electrical Power
3	PLC

The support systems are required to operate and control the process treatment systems. Pneumatic and electrical power are used to run equipment. Control power integrates the systems to ensure untreated waste streams are not inadvertently released.

A supplemental system to supply treated water for use as irrigation water for a phtyoremediation system in the central pump house area was added in 1999.

The As-Built drawings included as Appendix A, present the current system including the extensive modifications and expansion since 1999. Also, new equipment-specific information for additions and modifications to the original system have been incorporated into the following sections (except where noted) and can also be found in the vendor operation and maintenance and catalog information contained in Appendices C and D of this 2002 O&M Manual Update. This information is supplemental to the information contained in the original O&M Manual.

3.1 Bioventing System

3.1.1 System Description

The bioventing system consists of an injection biovent blower, intake filter and silencer, pressure relief filter and silencer, 16 biovent wells in the south pump house area, 18 new combination biovent/SVE wells in the north and central pump house area, and associated instruments, controls, and piping. The system injects air into the bioventing wells in order to stimulate biological activity in the treatment zone. The air entering the positive displacement biovent blower is drawn from ambient conditions, compressed, and then is distributed to the individual biovent wells via one of four headers. Refer to drawings G-001 and G-002 for the well locations and piping layouts.

In order to provide operational flexibility the new wells were designed to be operated as either air injection or vapor extraction wells interchangeably.

3.1.2 Major Equipment

3.1.2.1 Biovent Wells

Details regarding the 18 new combination biovent/SVE wells are presented in the Start-up Report. The typical design for these biovent/SVE wells is presented in Drawing W-002.

3.1.2.2 Wellheads

Both air-injection and vapor extraction plumbing is supplied to each of the north and central pump house area biovent wells. The wellheads are fitted with cam-lock quic-connect couplings to allow easy interchange between the air-injection and vapor extraction modes. The vaults are fitted with ¼" steel plate spring-assisted lids. Details for the biovent/SVE wellheads and vaults are presented in Drawings P-004 and P-005.

3.1.2.3 Biovent Piping

Biovent piping details for the north pump house expansion are presented in Drawing P-001 through P-003. Biovent piping stub-ups have been installed in expansion vaults located at the northern and southern ends of the north pump house area to allow for future system expansion if necessary. Biovent piping is generally Schedule 80 PVC.

3.1.2.4 Bioventing Blower

Note: no modifications apply to this section. The text of this section can be found in the original O&M Manual.

3.1.2.5 Over-Pressure Protection

Note: no modifications apply to this section. The text of this section can be found in the original O&M Manual.

3.1.3 Functional Description

Individual flow elements FE-317, FE-318, FE-319, and FE-320 are installed in each of the four headers to measure the flow of air to each header. These elements, in cooperation with valves HV-317, HV-318, HV-319, and HV-321 are used to establish and balance the initial flow distribution of air to each of the four headers.

Each biovent/SVE well is equipped with an individual ball-type rotameter that directly indicates flow. Hand valves in the air-injection piping allow each well to be individually

controlled. Each well hand is fitted with a temperature gauge and the air-injection plumbing contains a pressure gauge.

Bio-vent blower V-300 is energized by a local control hand switch HS-300 which may either be placed in the "auto", "off", or "jog" position. When HS-300 is in the "auto" position, bio-vent blower V-300 interlock I-6 is controlled by the permissive interlock described below:

INTERLOCK NUMBER	LOGIC
I-4	Hand switch HS-200 for vacuum blower V-200 must be in "auto" position.

No other system Interlocks receive permissive signals upon the latching of interlock I-6.

De-energization of blower V-300 (via hand switch signal), loss of the permissive interlock from I-4, the presence of an excessive discharge temperature (as detected by TSH-300), a low flow condition (as detected by FSL-300), or a high liquid level in the secondary containment berm, will shut down the biovent blower.

3.2 Groundwater and Product Recovery System Modifications

3.2.1 System Description

Groundwater and free product are extracted by total fluid recovery pumps submersed near the groundwater table surface in recovery wells RW-12, RW-13, RW-15 through RW-21 and PB206-3. The pneumatic power for pump operation is supplied by the compressed air support system. Each pump discharges into a common header prior to entering the treatment compound. Flow is regulated by increasing or decreasing air head pressure via adjustment of PCV-400 or the pressure regulators located in each the well vault of each total fluids recovery well. The liquid stream then enters influent tank T-105, and gravity drains to the oil-water separator (T-100), which separates the fluid stream into water and oil fractions. Separated fuel is pumped out of the oil-water separator to a 250-gallon free product storage tank (T-101), while the water containing dissolved fuel is pumped through 25-micron particulate filters (F-101A and F-101B operated in parallel) and then through liquid phase activated carbon adsorption vessels (T-102 and T-103 operated in series). The treated water is then stored in a 5,000-gallon storage tank, T-104. This tank provides temporary storage of the treated water before it is discharged to either the onsite phytoremediation irrigation system or to the concrete storm drainage culvert under the NPDES permit. Free product is

stored in the free product storage tank. The free product tanks are emptied by vacuum truck as needed and the product is transferred to on-site slop Tank 51. Tank 51 is managed by the DFSP San Pedro facility and the tank contents are periodically disposed to a recycling facility.

Note that the former total fluid recovery wells in the south pump house area, RW-1 though RW-8, were shut down in 1998. Wells RW-1 through RW-7 were later converted to soil vapor extraction wells, while RW-8 has remained inactive.

3.2.2 Major Equipment

3.2.2.1 Total Fluid Extraction Wells

Seven active 6-inch-diameter, schedule 40 PVC-cased extraction wells (RW-13, and RW-15 through RW-21) were installed in the north pump house area during 1999 and 2000 (see drawing G-002). The wells were generally installed with 20 feet of well screen extending up from five feet above the total well depth with 0.02-inch slotted casing surrounded by a silica sand pack. For more details, refer to drawing W-002 and refer to the Start-up Report. Additionally monitoring wells RW-12and PB206-3 were converted to extraction wells. Total fluid recovery pumps (Section 3.1.2.4) have been lowered to the water table within the well casing of these ten wells.

3.2.2.2 Total Fluids Extraction Well Vaults

Total fluids extraction well vaults are presented in Drawings P-006 and P-007 for the 1999 and 2000 system expansions, respectively. The vaults are all steel, with spring-assisted ¼" plate lids

3.2.2.3 Groundwater and Product Piping

Groundwater and free product are conveyed from the extraction wells to the liquid treatment system in double containment piping. Fittings, piping, and valves are either glued, threaded, or flanged. Double-containment total fluids piping and compressed air piping stub-ups have been installed in expansion vaults located at the northern and southern ends of the north pump house area to allow for future system expansion if necessary. Drawings G-001 and G-002 present the piping layputs. Piping details are presented in Drawings P-001 through P-003.

3.2.2.4 Total Fluid Recovery Pumps

AutoPump® AP-4/TL submersible, pneumatically operated, low volume, top-loading pumps supplied by Clean Environment Equipment were installed into each extraction well casing to between 0.5 and 2 feet below the oil-water interface. Flow regulation is achieved by throttling the air pressure control valve (FCV-400) or the pressure regulators in each recovery well vault. Fluid enters the pump through a check valve located at the top. Pump operation occurs when a sufficient volume of fluid has accumulated in the collection chamber to force the float to actuate a limit switch. Compressed air (Section 3.4) then enters a diaphragm, which forces the fluid into the discharge hose and on to the total fluids piping headers. When the pump collection chamber has emptied, the float falls to its lower-most position and shifts the pneumatic valve to exhaust compressed air into the well casing. The pump fills again, and the cycle is repeated. Since the pumps are top filling, the well drawdown is limited to the depth of the top of the pump. Generally sufficient compressed air is supplied to the pump so that pump is rapidly evacuated allowing the drawdown to be maintained at the depth of the pump intake as long as the well recharge does not exceed the pump capacity.

The AutoPump® AP-4/TL from the former total fluids extraction wells RW-1 through RW-8 were removed and overhauled. The six pumps were made operational have been relocated to the north pump house area wells RW-12, RW-13, RW-15 through RW-17and PB-206-3. These six pumps are “short” AP-4/TL. With an average capacity of 0.25 gallon per cycle. New regular AP-4/TL pumps were procured and installed in wells RW-18 through RW-21. The regular AP-4/TL pumps have an average capacity of 0.65 gallons per cycle.

3.2.2.5 Oil-Water Separator

Note: no modifications apply to this section. The text of this section can be found in the original O&M Manual.

3.2.2.6 Transfer Pumps

Transfer pump P-102: Note: no modifications apply to this section. The text of this section can be found in the original O&M Manual.

Transfer pump P-100: Note: no modifications apply to this section. The text of this section can be found in the original O&M Manual.

Centrifugal transfer pump P-101 removes water from the treated water storage tank and discharges it to the storm drain under the NPDES permit (Section 2.2). Control of this pump has been modified. Currently, the PLC is programmed to operate this pump as long as the water level in the tank is above the low-level set point and either the irrigation controller demands water for the phytoremediation irrigation system or the tanks high-level set point has been reached. Tank level is measured by a Kobold NEO-5001 ultrasonic level transmitter (LT-101).

3.2.2.7 Particulate Filters

Note: no modifications apply to this section. The text of this section can be found in the original O&M Manual.

3.2.2.8 Liquid Phase GAC Vessels

Operation of the liquid phase carbon vessels remains the same, with the exception that the activated carbon used in the vessels has been changed from coal-based carbon to coconut-shell based carbon due to problems with elevated effluent sulfides concentrations caused by leaching of sulfides from coal-based carbon matrix.

3.2.2.9 Functional Description

The main solenoid valve FCV-400 and the compressed air line vent solenoid valve FCV-401 control the supply of influent groundwater into the treatment complex as delivered by the in-well pneumatic pumps. Control of influent water is accomplished by controlling compressed air flow to the in-well pneumatic pumps. When the water treatment system is fully operational FCV-400 closes to shut off the air compressed air supply and FCV-401 open to vent the residual pressurized air from the supply line, thus prevent untreated water from entering the treatment complex unless. Refer to the compressed air system functional description Section 3.4.3 for a description of controlling interlocks and failure modes for solenoid valves FCV-400 and FCV-401. The de-energization of solenoid valves FCV-400 and FCV-401 effectively stops the delivery of liquid to the treatment complex; however, processing and treatment of liquids already delivered to the system may proceed independent of the position of this valve.

Valve FCV-400 is controlled for energization through the following permissive interlocks:

INTERLOCK NUMBER	LOGIC
I-2	Hand switch HS-100 for transfer pump P-100 must be in the "auto" position.
I-8	Hand switch HS-400 for air compressor K-400 must be in the "auto" position.
I-9	Hand switch HS-102 for transfer pump P-102 must be in the "auto" position.

Individual pressure and motive compressed air volume to each total fluids extraction pump may be monitored and controlled via pressure indicators and air throttling valves that are located in each well vault.

Free product that collects within the oil-water separator (T-100) is removed to the dual contained free product storage tank (T-101) by positive displacement transfer pump P-102. Transfer pump P-102 is energized upon the detection of a high free product level in the reservoir of the oil-water separator by high level switch LSH-103. The liquid removal logic is intended to totally drain the reservoir, with pump de-energization controlled by the indication of low discharge flow as detected by flow switch FSL-102. Failure of the pump to energize, thus producing a rising free product reservoir level, which eventually initiates an alarm via high-high level switch LSHH-103. Upon the activation of this alarm condition the PLC unlatches the signals to interlocks, I-1 and I-3, thus suspending the delivery of liquids to the system. Indication of a high-high free product level in the free product storage tank, via LSHH-102, initiates similar action with the additional loss of latching signals to interlocks I-8 and I-10 to shutdown the air compressors and a loss of latching signal to interlock I-9 to shutdown free product transfer pump P-102.

Transfer pump P-102 requires no permissive interlocks for energization. However, hand switch HS-102, which controls the energization of the pump, must be placed in it's "auto" position to provide permissive interlock latching signals through its interlock, I-9 to the equipment listed below:

INTERLOCK NUMBER	LOGIC
I-1	Latching signal to main solenoid valve FCV-400, permitting compressed air to be delivered well pumps.
I-3	Latching signal to transfer pump P-200 permitting liquid discharge into the oil-water separator T-100 from the air-water separator T-200.
I-8 and I-10	Latching signal to air compressors K-400 and K-410, permitting generation of compressed air.

Transfer pump P-102 is protected from over-pressurization by discharge pressure safety valve PSV-102, which directs high-pressure liquid to the pump's suction should isolation valve HV-100 be closed inadvertently.

The volume of product discharged from the oil/water separator is detected and recorded by turbine type totalizing flowmeter, FQI-100.

Removal of separated water from the oil-water separator is done via centrifugal transfer pump P-100. Indication of high water level in the oil-water separator's water reservoir via level switch LSH-100 initiates energization of transfer pump P-100, while de-energization is initiated via indication of low liquid level by level switch LSL-100. Failure of pump P-100 to remove these liquids due to equipment malfunction or the inadvertent closure of subsequent valve, (thus giving rise to an increasing water level within the oil-water separator as detected by high-high level switch LSHH-100) initiates an alarm condition and de-energizes the groundwater extraction and treatment system. To be present for energization transfer pump P-100 requires the permissive interlock signal as outlined below :

INTERLOCK NUMBER	LOGIC
I-7	Permissive latching signal from transfer pump P-101, indicating that pump hand switch HS-101 has been placed in its "auto" position and that T-104 is not full.

Energization of transfer pump P-100 is via hand switch HS-100. Its energization initiates permissive interlock latching signals to equipment through its Interlock I-2, as shown below:

INTERLOCK NUMBER	LOGIC
I-1	Latching signal to main solenoid valve FCV-400, permitting compressed air to be delivered to well pumps.
I-3	Latching signal to transfer pump P-200, permitting liquid discharge into the oil-water separator T-100 from the air-water separator T-200.

Transfer pump P-100 is protected from dead-head conditions, or low flow operation energization, via flow switch FSL-100. Pressure indicators PI-100A and PI-100B were installed downstream of the pump, prior to the particulate filters F-101A and F-101B, for visual verification of pump discharge pressure.

Indication of the differential pressure across, and the need to change either particulate filter (F-100A/B) cartridges is obtained by comparing filter outlet pressure displayed on pressure indicators PI-110A and PI-110B with the inlet pressure displayed on PI-100A and PI-100B, respectively. Filter elements are changed when approximately 15 psig differential pressure is indicated across either filter. A high-high differential pressure switch PSHH-100 was installed parallel to PSH-100 to protect the system from contamination should any loaded filter not be changed, thus risking filter bag failure. An indication of high-high differential pressure (via pressure switch PSHH-100), initiates an alarm condition and de-energization of transfer pump P-100 via Interlock I-2.

Switch over to direct flow through one of the two filters (F-101B or F-101A) is accomplished by manual manipulation of inlet hand valves HV-115 and HV-113 and outlet hand valves HV-116 and HV-114.

Discharge of liquid from the particulate filters enters liquid phase granular activated carbon (LGAC) vessel T-102. LGAC inlet samples are collected from analysis port AP-109. The T-102 discharges to LGAC vessel T-103. Analysis port AP-112 located between the two vessels is used to collect samples to check for breakthrough of the primary carbon vessel. Analysis port AP-113 is used to collect samples from the T-103 discharge. Each carbon vessel is equipped with camlock couplings at the entry and discharge nozzles to expedite

removal and installation. A pressure transmitter, PT-100, has been installed in the inlet piping to tank T-102 to allow the PLC to monitor the back-pressure at the LGAC inlet through an analog input signal from PT-100.

The level within treated water storage tank T-104 may be visually verified by marks on the side of the tank. The PLC monitors the water level within tank T-104 by an analog input signal from ultrasonic level transmitter, LT-101. Removal of water from the tank by transfer pump P-101 is accomplished when the liquid level exceeds the PLC's high-level set point. De-energization of pump P-101 is automatically achieved upon the removal of water from T-104 down to the PLC's low-level point through interlock I-7.

Failure of transfer pump P-101 to withdraw water from the water storage tank, giving rise to fluid levels that exceed the high-high level set point will initiate the de-energization of pump P-100 through interlock I-2.

Transfer pump P-101 requires no permissive interlocks from other equipment for energization. Control of interlock I-7 and energization of transfer pump P-101 is via hand switch HS-101. Energization of transfer pump P-101 initiates the permissive Interlock latching signals to the equipment through its interlock I-7, as outlined below.

INTERLOCK NUMBER	LOGIC
I-2	Latching signal to transfer pump P-100, permitting the energization of this pump via hand switch HS-100.
I-3	Latching signal to transfer pump P-200, permitting liquid discharge into the oil-water separator T-100 from the air-water separator T-200.

Transfer pump P-101 is protected from inadvertent dead head operating conditions, due to the blockage in subsequent piping or closure of discharge hand valve HV-122 or HV-101 (or HV-500 when system is discharging to irrigation system.), by pressure safety valve PSV-100 connected between the pump's discharge header and the water storage tank. At discharge pressures greater than 125 psig, PSV-100 opens to relieve pump discharge to the water storage tank.

Analysis port AP-101 was installed downstream of PSV-100 to provide for ease of obtaining a water sample. Discharged water from P-101 is directed to a 2-inch under- and

aboveground plastic pipeline to a concrete drainage ditch located to the northwest of the treatment area. The volume of treated water discharge to the concrete drainage ditch under NPDES permit is detected and recorded by turbine type totalizing flowmeter, FQI-101. Discharge pressure may be observed through pressure indicator PI-101.

3.3 Vapor Extraction and Treatment System

3.3.1 System Description

A vapor extraction system is operated primarily to enhance the flow of air though the vadose-zone and therefore enhance bioventing effectiveness. The collected VOC laden vapors are delivered to an air-water separator where entrained liquids are extracted from the stream, leaving vapors for treatment. These vapors then are cooled in a heat exchanger prior to being processed in two VGAC vessels operated in series. Effluent from these vessels is discharged to the atmosphere. Residual liquids extracted from the stream are delivered to the oil-water separator of the groundwater and product recovery system for further processing.

3.3.2 Major Equipment

3.3.2.1 Vapor Extraction Wells

Eight 4-inch diameter, schedule 40 PVC-cased extraction wells (RW-1 through RW-8) were installed in the middle of the area (as shown in drawing G-001) to a depth of approximately 50 feet below ground surface. The wells were originally configured to extract both vapors and total fluids from each well. The total fluids extraction pumps have been removed and wells RW-1 through RW-7 are now operated solely as vapor extraction wells. Refer to drawings G-001 and G-002 for well locations and piping layouts. As described in Section 3.1 above, 18 new combination biovent/SVE wells have been installed in the northern and central pump house area. These wells can be readily interchanged between the air-injection and vapor extraction modes. Drawing W-002 presents a typical biovent/SVE well. Further details are presented in the Start-up Report.

3.3.2.2 Wellheads

See Section 3.1.2.2 above.

3.3.2.3 Vapor Piping

Vapor extraction piping details are presented in Drawings P-001 through P-003. As was the case for the bioventing piping, vapor extraction piping stub-ups have been installed in the

expansion vaults located at the northern and southern ends of the north pump house area. These vaults will allow for further expansion of the vapor extraction system if necessary. The header piping is constructed of Schedule 40 PVC. Fittings, piping, and valves are either glued, threaded, or flanged.

3.3.2.4 Air-Water Separator

Note: no modifications apply to this section. The text of this section can be found in the original O&M Manual.

3.3.2.5 Transfer Pump

Note: no modifications apply to this section. The text of this section can be found in the original O&M Manual.

3.3.2.6 Vacuum Blower

Note: no modifications apply to this section. The text of this section can be found in the original O&M Manual.

3.3.2.7 Heat Exchanger

Due to compression, the temperature of the vapor stream rises as it is processed through the vacuum blower. An Xchanger, Inc. Model AA-500 air-to-air heat exchanger was upgraded to a Model AA-1000 air-to-air heat exchanger (X-200) in 1999. The heat exchanger is installed in the system downstream of the vapor extraction blower (V-200) to cool the influent air stream prior to its entrance to the first GAC vessel. The Model AA-1000's fan forces approximately 3,900 scfm of ambient air upwards over an aluminum plate fin core through which the contaminated vapor flows. The heat exchanger is rated for approximately 67,000 BTU/hr total heat exchange.

3.3.2.8 Vapor-Phase GAC Vessels

Note: no modifications apply to this section. The text of this section can be found in the original O&M Manual.

3.3.3 Functional Description

When properly latched, vacuum blower V-200 energizes, extracts vapor from site soils and through the air-water separator (T-200), and provides motive pressure to process the airstream through the air-air heat exchanger (X-200), and through the two vapor-phase GAC

vessels T-202 and T-203. Operation of the system via energization of V-200 is dependent upon the energization and acquisition of the permissive interlock latching signals, as outlined below.

INTERLOCK NUMBER	LOGIC
I-3	Hand switch HS-202 has been placed in the "auto" position, high-high level conditions have not been detected by either the OWS water side high-high level switch LSHH-100 or the product side high-high level switch LSHH-103.
I-5	Hand switch HS-201 for air-air heat exchanger X-200 must be in the "auto" position.

Energization of vacuum blower V-200 initiates a permissive interlock latching signal to the equipment through its Interlock I-4.

INTERLOCK NUMBER	LOGIC
I-6	Latching signal to bio-vent blower V-300 permitting the energization of this blower via hand switch HS-300.

Upon de-energization of V-200 (via hand switch signal from HS-200, loss of one or more permissive interlock signals, or a high-high liquid level in the secondary containment berm via LSHH-104), the signal is created to de-energize biovent bower V-300 through interlock I-4.

INTERLOCK NUMBER	LOGIC
I-6	Biovent blower V-300 de-energization.

The vacuum blower is protected from low flow conditions and under-pressurization via low flow switch FSL-200 and pressure safety valve PSV-200, which are located downstream and upstream, respectively, of the blower. The blower and GAC vessels are further protected from overheating conditions by high temperature switch TSH-200 located at the blower discharge. This switch acts as a secondary fail-safe mechanism to de-energize the vacuum

blower should the air-air heat exchanger fail, or if downstream valves inadvertently are throttled excessively or closed, thus dead-heading the fan.

Prior to the entrance of the vapor stream to the blower, the stream passes through an air-water separator, which separates any liquids entrained in the stream. These liquids then are conveyed for treatment to the oil-water separator T-100 by transfer pump P-200. Transfer pump P-200 is energized and de-energized upon indication of high and low liquid levels via high level switch as LSH-200 and LSL-200, respectively. The P-200 energization is dependent upon the energization and acquisition of the permissive Interlock signals listed below:

INTERLOCK NUMBER	LOGIC
I-2	Hand switch HS-100 for transfer pump P-100 must be in its "auto" position.
I-9	Hand switch HS-102 for transfer pump P-102 must be in its "auto" position.

Energization of transfer pump P-200 is via hand switch HS-202. Its energization initiates a permissive interlock latching signal to vacuum blower V-200 through interlock I-3 as shown below:

INTERLOCK NUMBER	**LOGIC**
I-4	Latching signal to vacuum blower V-200, permitting vapor extraction.

The vapor flow rate, temperature, and pressure entering the air-water separator via the main header is measured by flow elements FE-209, FE-210, and FE-212, temperature indicator TI-209, and pressure gauge PI-209. Each header is fitted with a quick-connect port to allow measurement of pressure with a single pressure gauge and to allow sample collection when necessary. Total system extraction flow is manually controlled by throttling hand valve HV-209, and, if necessary, purge hand valve HV-217. Opening of hand valve HV-217 permits the inflow of ambient air into the system (via filter and silencer F-200), thus reducing both withdrawal flow volume and applied header vacuum. Process and instrumentation drawings (P&ID) X-002 and X-003 depict the piping connections for extraction lines and headers and wells associated with each header. These drawings also present the valves, sample ports,

flow elements, temperature indicators, and pressure gauges associated with each well and header.

The blower (V-200) discharge is directed to heat exchanger (X-200), which removes excessive heat from the air stream prior to its entrance to the GAC vessels. The heat exchanger fan is thermostatically controlled via temperature switch TSHL-200. The temperature switch is a Dwyer inert gas activated Bourbon tube type pressure switch with a fully adjustable deadband.

The energization of the heat exchanger fan requires no permissive interlock signals in order to be energized. However, when hand switch HS-201 is placed in its "auto" position, fan energization only occurs upon the indication of a high air stream temperature as detected by TSHL-200. Interlock I-5 provides a latching signal to the vacuum blower, permitting the energization of the blower via hand switch HS-200.

Upon de-energization of the heat exchanger fan (via hand switch signal), a signal is created to de-energize V-200 through interlock I-5.

INTERLOCK NUMBER	LOGIC
I-4	Vacuum blower V-200 de-energization.

The heat exchanger effluent is directed through a series of GAC vessels as the final treatment process. Each GAC vessel is equipped with camlock entry/discharge nozzles to expedite removal and installation.

Analysis ports AP-209 at the inlet to T-201, AP-210 at the outlet of T-201, and AP-211 at the outlet of T-202 were installed to allow collection of vapor stream samples. Flow element FE-211 and temperature gauge TI-213 measure the exiting air flow and temperature prior to vapor discharge to atmosphere. Flow transmitter, FT-211, has been installed to allow the PLC to monitor the vapor discharge rate through an analog input signal from FT-211.

3.4 Compressed Air System

3.4.1 System Description

The compressed air system provides high pressure, service-quality motive air for operation of the total fluid recovery pumps. The original two-cylinder, dual-stage, oil-lubricated air

compressor, 60-gallon receiver tank, a pressure regulator, and an inlet air filter with a silencer have been augmented by the addition of a 10 hp, 40 cfm rotary screw air compressor. The larger compressor was needed to provide sufficient compressed air to operate the additional total fluids extraction pumps put into service in 2000. Pressure regulator PCV-400 maintains air header pressure to the total fluids extraction pumps.

3.4.2 Major Equipment

3.4.2.1 Air Compressors

The original system included an Ingersoll-Rand type 30234 N1.5 two-stage reciprocating air compressor (K-400) is rated to provide a minimum of 6.5 cubic feet per meter (cfm) of air at 100 psig.

As part of the free product recovery system expansion activities of 1999 and 2000, a new air compressor, a Kaeser SM-11 rotary screw compressor, with greater air capacity was installed. The SM-11 compressor is a 10 hp, 40 cfm, and 120 psig rated compressor, with an on board PLC controller (SIGMA CONTROL). The SM-11 is driven by a 460 volt, 3-phase NEMA Standard TEFC electric motor. The Ingersoll-Rand compressor has been retained as a backup unit, and the original receiver tank with automatic condensate drain is used for both compressors.

The new Kaeser SM-11, designated air compressor, K-410, is generally referred to as Air Compressor-A, and the backup air compressor, K-400, is referred to as Air Compressor-B.

Air Compressor-A contains its own PLC, a SIGMA-CONTROL unit, which allows a wide variety of operational settings. The SIGMA CONTROL controls, regulates, protects, and monitors the compressor package. The unit automatically switches from load to idle or standstill ensuring optimal utilization of the drive motor. The unit will automatically shutdown the compressor package if overcurrent, overpressure, overtemperature, or other critical operational exceedance occurs. The unit also provides maintenance alerts for routine maintenance by using a service hour counter.

3.4.3 Functional Description

A selector switch, HS-402, located at the electrical disconnect cabinet for Air Compressor-B allows a signal to be provided to the PLC which then energizes the selected compressor. Air Compressor-A was installed with a separate fusible-disconnect. The interlock scheme is

paralleled for both air compressors so that the interlock latching/unlatching behavior is the same regardless of which air compressor is selected and operating.

Whichever air compressor is selected at selector switch HS-402 is energized by hand switch HS-400. HS-400 may either be placed in the "off", "auto", or "hand" positions. In the "auto" position, interlock I-8 will accept a signal from the air receiver pressure switch PSHL-400, which, if the receiver air pressure is below the desired set point, initiates a compressor run sequence. If the receiver pressure is above the desired pressure, then Air Compressor-B remains on standby, awaiting an energization signal. Should the pressure in the air receiver fall below a minimum desired pressure, an alarm signal is created via the energization of pressure switch PSL-400.

If HS-402 is set to Air Compressor-A and HS-400 is in the “auto” position. Interlock 10 will accept a signal from the SIGMA CONTROL unit on the air compressor indicating that the compressor is in the remote “on/off” operation mode and that the compressor is ready for operation. The PLC then allows energization of the compressors remote start relay allowing the SIGMA CONTROL unit to operate compressor. If Air Compressor-A has not been left in the remote “on/off” mode or is not set to “On” at the SIGMA CONTROL panel, then interlock I-10 will unlatch not allowing operation of Air Compressor-A.

If the SIGMA CONTROL unit registers an alarm it shuts down the compressor and signals the PLC. Also, if the PLC receives and alarm signal from the SIGMA CONTROL unit, then interlock I-10 will remain unlatched until the alarm condition ceases and the unlatch condition is manually cleared. The manual clearing of the unlatch conditions has been implemented as a precautionary measure to allow inspection and mitigation of the alarm condition precursors prior to PLC automatic operation of Air Compressor-A

3.5 Electrical System

Note: no modifications apply to this section. The text of this section can be found in the original O&M Manual.

3.6 PLC System

3.6.1 System Description

Equipment operation, alarm capability, and system integration are controlled by a PLC that monitors the input/output (I/O) states of various control devices and motor starters. Based on the system program, the PLC directs the operation of equipment through various interlocks to

preclude off-site releases of contaminated liquids or vapors. Input signals are monitored by the PLC with outputs to start or stop equipment or alert the operator when process parameters are exceeded.

The PLC is a modular I/O controller that uses an Allen-Bradley SLC 5/03 microprocessor. It is rated for operation in Class I, Division 2 hazardous environments.

3.6.2 Major Equipment

3.6.2.1 Main Control Panel

The main control panel consists of the Allen-Bradley SLC 5/03 PLC microprocessor, a federal alarm horn, and associated control wiring. The panel is enclosed in a NEMA 4 enclosure.

3.6.2.2 PLC

The main control panel contains the PLC to control system operation. The PLC receives operating power from panel PP-GWT2. Control signals are transmitted from parameter monitoring instrumentation to activate commands to start, stop, and emergency shutdown process equipment based on pre-programmed logic instructions received from locally mounted measuring devices. An Allen-Bradley SLC 5/03 processor with modular inputs was installed to control system operation. If an abnormal condition develops requiring operator action, an auto-dialer automatically calls a maintenance telephone number to alert the operators.

The PLC has been configured for remote monitoring and operation using a remote computer running Rockwell Software RSLogix500 software using DH485 communication protocol.

The PLC program has been modified to datalog selected process operating variables including

- total fluid influent flowrate via analog input signal from flow transmitter FIT-100,
- tank T-104 water level via analog input signal from ultrasonic level transmitter LT-101,
- liquid phase GAC vessel T-102 inlet pressure via analog input signal from pressure transmitter PT-100,
- compressed air supply line pressure via analog input signal from pressure transmitter PT-410, and

- vapor phase carbon air discharge flow rate via analog input signal from flow transmitter FT-211.

These parameters are then available for evaluation of system performance.

3.6.2.3 Interlocks

Various interlocking functions are programmed into the PLC (as summarized in Table 3-1 to control process operation with safety as the primary objective. The ladder logic ensures that equipment failures preclude further withdrawal of contaminated liquids and vapors to prevent an untreated release from occurring. Hand switches are provided to control equipment operation and can be placed in "off", "auto", "jog", or "hand" positions. The "jog" position allows the rotation of equipment through a momentary contact switching mechanism. All interlocks are bypassed in this position. When the hand switch is in the "off" position, the associated equipment motor is prohibited from energizing due to a remote start signal. "auto" allows the equipment to operate according to the interlock logic associated with the system. "Hand" bypasses permissive interlock requirements as determined by the PLC. This allows testing individual equipment without having to satisfy the interlocks.

3.6.2.4 Instrumentation

In addition to interlocks, instrumentation is provided for monitoring process parameters such as temperature, pressure, and flow. Table 3-2 contains a description of each element utilized in the system. The information from the instruments is used to monitor overall system operation, determine if operator action is necessary to equalize process flows, enhance system performance, or correct a developing abnormal condition. An auto-dialer is provided to alert the operator of the need for immediate corrective action.

3.6.2.5 Control Devices

Control devices provide input to the interlocks to control system operation. These include level, temperature, pressure, and differential pressure switches. The switches will be calibrated to actuate at a pre-determined setpoint that signals equipment operation (start or stop). Table 3-3 lists the control devices and the applicable set points. Alarms are provided to alert the operator of the need for immediate corrective action.

3.7 Phytoremediation Irrigation System

3.7.1 System Description

The groundwater treatment system has been modified to provide irrigation water on-demand to the phytoremediation irrigation system. The modifications include the installation of below grade treated water discharge piping from the treatment compound to the irrigation manifold (located in north pump house area), solenoid control valves, and back flow prevention devices.

3.7.2 Functional Description

When the treated water discharge to the irrigation system is not operational, treated water from T-104 is discharged to the storm water drainage culvert located south of the facility and irrigation supply water is obtained from the facilities potable water supply. However, when the treated water discharge to the irrigation system is operational and the irrigation controller is active, treated water is discharged to the irrigation system and the facilities potable water supply is isolated. This achieved through the interlocking of four solenoid valves, FCV-500 through FCV-502, with the irrigation control relay (ICR). FCV-500 and FCV-501 are located at the treatment complex, while FCV-502 and FCV-503 are located at the irrigation manifold. The storm drain discharge solenoid, FCV-500 is energized when closed (fail-opened). The treatment complex irrigation discharge solenoid (FCV-501) is energized when open (fail-closed). The irrigation manifold irrigation discharge solenoid (FCV-502) is energized when open (fail-closed), and the domestic water solenoid (FCV-503) is energized when closed (fail-opened). Supply of irrigation water is not dependent on the operational status to the groundwater treatment system. If the system is shutdown then FCV-503 will open and FCV-502 will close, allowing domestic water supply to the irrigation system. The irrigation controller supplies a signal to the PLC, which is programmed with interlock logic to energize the solenoid valve under the following conditions:

- Water level in treated water storage tank T-104 is not below the low-level set point.
- Treated water transfer pump P-101 is not in latching shutdown condition.
- Irrigation control relay ICR is active.

To be present for energization transfer pump of solenoid valve requires the permissive interlock signal as outlined below:

INTERLOCK NUMBER	LOGIC
I-7	Permissive latching signal from transfer pump P-101, indicating that pump hand switch HS-101 has been placed in its "auto" position and that T-104 is not full as detected by LSHH-101.

Hand valves HV-500 and HV-502 are installed in the treated water discharge to irrigation system piping at the compound and at the irrigation manifold, respectively. These valves allow the manual shutdown of the treated water discharge to the irrigation system. Pressure regulator PCV-500 is located in the compound to regulate the treated water supply pressure to the irrigation manifold. The volume of water discharged to the irrigation system is detected and recorded by turbine type totalizing flow meter FQI-500. Treated water irrigation supply pressure may be observed through pressure indicator PI-500 located at the treatment compound and PI-501 located at the irrigation manifold.

4.0 Operational and Control Procedures

This section details the specific steps to take to check and operate individual components of the system. Refer to process and instrumentation diagrams (PI&Ds) for the systems, Drawings X-001, X-002, and X-003. Additional detailed information for new components is available in the manufacturer information in Appendices C and D of this 2002 O&M Manual Update. Additional information for pre-existing equipment can be found in Appendices C and D of the original O&M Manual. Manufacturer written instructions should be consulted prior to beginning any site operations.

NOTE: System start-up and testing must be performed by fully trained and qualified individuals with experience with PLCs. Unqualified individuals must not execute start-up steps unless under the guidance of the project engineer.

4.1 Prerequisite Conditions

Prior to full system start-up and operation, the following prerequisite items must be observed and verified:

- All safety rules and regulations are enforced.
- All instruments have been calibrated and properly installed.
- PLC diagnostics have been run, and the PLC is verified in full operational mode.
- Personnel performing the start-up have received appropriate operations training.
- Adequate manpower is available to assist in the entire system monitoring during the start-up phase.
- All equipment, valves, and instruments are tagged.

4.2 Pre-Start-up Inspection

System start-up involves a pre-start-up inspection of the entire system and testing of major treatment equipment and instruments. This ensures that pre-existing problems are identified up front to prevent additional malfunctions to other equipment from occurring. Furthermore, because of the interdependencies among the various processes, proper valve positioning and control device settings are imperative for equipment and operator safety.

Prior to initial start-up, all equipment, including electrical components, instruments, and control panels, must be inspected. Procedures pertaining to equipment and instrument inspection, calibration, and general maintenance are addressed in Section 5.0.

Equipment-specific details are provided in the vendor's O&M instructions found in Appendices C and D of this 2002 O&M Manual Update and in the original O&M Manual.

Equipment testing prior to placing it in full service entails verification of system integrity, proper rotation, and control device relay operation. Any unsatisfactory results must be evaluated to determine the impact on the entire system. If necessary, any defective components must be repaired or replaced before commencing air injection and contaminant extraction. Prerequisite conditions and procedures for start-up testing related to system commissioning are provided in the pre-startup checklists.

4.2.1 Groundwater and Product Recovery System

For the groundwater and product recovery system, verify that the following start-up conditions have been met:

- Total fluid recovery pumps have been properly installed in each recovery well.
- Flow elements FQI-100 and FQI 101 have been properly installed and calibrated.
- Transfer pumps P-100, P-101, and P-102 have been properly installed and have been jogged to verify proper rotation.
- Oil-water separator T-100, free product storage Tank T-101, filters F-101A/B, liquid- phase GAC vessels T-102 and T-103, and treated water storage tank T-104 have been properly installed, all inlet/outlet ports connected properly, all vents opened, drains closed, and any spare openings plugged.
- The following instruments have been verified as being calibrated, installed, and are fully functional:
  - FSL-100, FSL-101, and FSL-102
  - PSV-100 and PSV-102
  - LI-100
  - PI-100A/B, PI-101, PI-102, PI-110A/B, PI-104
  - LSHH-102
  - LSL/LSH/LSHH-100 and 101
  - PDI/PSH/PSHH-100
  - LSH/LSHH-103
  - LT-101
  - PT-100
  - FIT-100
  - FQI-100
  - FQI-500
  - PI-501
  - PI-500

- Interlocks I-2, I-7, and I-9 have been properly programmed, and all associated hand switches (HS-100, HS-101, and HS-102), wiring, instrument connections, and alarms have been installed.
- All piping and valves have been installed, and all valves have been aligned per the P&ID. Instrument root valves have been fully opened.
- Hydro/leak testing of the piping and appropriate components has been successfully completed and appropriate documentation has been approved.
- All hangers and supports have been installed.
- All equipment anchor bolts and straps have been installed and proper hold down bolt torques applied.
- Desiccant, temporary packing, plugs, and shipping softeners and braces surrounding vendor-supplied instruments have been removed from oil-water separator T-100, filters F-101A/B, and liquid-phase GAC vessels T-102 and T-103.
- Any remaining vendor-specific directed action has been completed on the equipment as identified in the vendor-supplied O&M manuals located in Appendix C of either the original O&M Manual or this 2002 O&M Manual Update.

4.2.2 Vapor Extraction and Treatment System

For the vapor extraction and treatment system, verify that the following start-up conditions have been met:

- Air heat exchanger X-200 and air-water separator T-200 have been properly installed, all inlet/outlet ports connected properly, all vents opened, drains closed, and any spare openings plugged.
- Flow elements FE-209 through FE-211 are properly installed and calibrated.
- Vacuum blower V-200 has been properly installed and has been jogged to verify proper rotation.
- Filter F-200 has been properly installed and HV-217 is fully opened.
- The following instruments have been verified as calibrated, installed, and are fully functional:
  - FSL-200 and TSH-200
  - TSHL-200
  - LSL/LSH/LSHH-200
  - TI-209
  - PI-209
  - FE-210
  - FE-211/FT-211

  - TI-211 through TI-213
  - FE-212

- Vacuum relief valve PSV-200 has been calibrated, installed, and is fully functional.
- Interlocks I-3, I-4, and I-5 have been properly programmed, and all associated hand switches (HS-202, HS-200, and HS-201), wiring, instrument connections, and alarms have been installed.
- Pneumatic pressure leak testing of the piping and appropriate components has been successfully completed and appropriate documentation has been approved.
- All hangers and supports are installed.
- All equipment anchor bolts and straps have been installed and proper hold down bolt torques applied.
- Desiccant, temporary packing, plugs, and shipping softeners and braces surrounding vendor-supplied instruments have been removed from heat exchanger X-200, air-water separator T-200, filter F-200, transfer pump P-200, and vapor extraction blower V-200.
- Any remaining vendor-specific directed action has been completed on the equipment as identified in the vendor-supplied O&M manuals located in Appendix C of either the original O&M Manual or of this 2002 O&M Manual Update.

4.2.3 Bio-Venting System

For the bio-venting system, verify that the following start-up conditions have been met:

- Bio-venting blower assembly, comprised of the blower V-300, pressure relief valve PSV-300, silencer S-300, inlet filter F-300, and blowoff silencer S-301, has been properly installed, all inlet/outlet ports connected properly, drains closed, and any spare openings plugged.
- All piping and valves have been properly installed.
- The following instruments have been verified as calibrated, installed, and are fully functional:
  - PI-317 and PI-320
  - TI-317 through TI-320
  - FE-317 through FE-320
- Instrument root valves have been confirmed fully opened.
- Hydro-testing of all piping and appropriate components to ASME B31.1, Power Piping Code requirements has been successfully completed.

- All hangers and supports, expansion joints, sway struts, and rigid restraints have been installed.
- Pressure relief valve PSV-300 has been properly calibrated and set to its desired relief pressure. All spring retaining straps have been removed, and the valve has been installed properly.
- Pneumatic pressure leak testing of the piping and appropriate components has been successfully completed and appropriate documentation has been approved.
- Desiccant, temporary packing, plugs, and shipping softeners and braces surrounding vendor-supplied instruments have been removed.
- Any remaining vendor-specific directed action has been completed on the equipment as identified in the vendor-supplied O&M manuals located in Appendix C of either the original O&M Manual and of this 2002 O&M Manual Update.
- Appropriate personnel warning signs have been installed.

4.2.4 Compressed Air System

For the compressed air system, verify that the following start-up conditions have been met:

- Air compressor assembly comprised of the compressors K-400 and K-410, check valves XV-401 and XV-402, air receiver T-400, pressure relief valve PSV-400, silencer S-400, inlet filter F-400, condensate trap XV-400, and air coalescing filter F-401, has been properly installed, all inlet/outlet ports connected properly, drains closed, and any spare openings plugged.
- Filter F-401 has been properly installed and the drain valve closed.
- Pressure regulating valve PCV-400 has been properly calibrated, set to the desired pressure, and installed properly.
- Compressed air line low pressure switch PSL-410 has been properly installed.
- Flow Control solenoid valve FCV-400 has been properly installed.
- Compressed air supply line discharge solenoid valve FCV-410 has been properly installed.
- Interlocks I-1, I-8, and I-10 have been properly installed, and all associated hand switches (HS-401, HS-400, and HS-402), wiring, instrument connections, and alarms have been installed.
- All piping and valves have been installed and all valves have been aligned per the P&ID. Instrument root valves are fully open.
- Air compressors K-400 and K-410 have been jogged to assure proper rotation.

- Hydro/pneumatic pressure leak testing of the piping and appropriate components has been successfully completed and appropriate documentation has been approved.
- All hangers and supports have been installed.
- All equipment anchor bolts and vibration control devices are installed and proper hold down bolt torques applied.
- Desiccant, temporary packing, plugs, and shipping softeners/braces surrounding vendor supplied instruments are verified removed from the air compressor assembly skid, pressure control valve PCV-400, and solenoid valve FCV-400.
- The following instruments are verified as calibrated, installed and fully functional:

  - PSL/PSHL-400
  - PI-400
  - PT-410

- Any remaining vendor specific directed action is completed on the equipment as identified in the vendor supplied O&M manuals located in Appendix C of either the original O&M Manual and of this 2002 O&M Manual Update.

4.3 Start-Up Procedures

Start-up procedures are as follows:

- Ensure that the pre-start-up inspection has been completed.
- Move the following hand switches to their "auto" position:

  - HS-100 (transfer pump P-100)
  - HS-101 (transfer pump P-101)
  - HS-102 (transfer pump P-102)

- **NOTE**: In this position, with fluids absent from the system, **no** equipment should energize. If any equipment energizes, return the respective hand switch to "off", and investigate and resolve the power or control cable error prior to proceeding further.
- Connect a temporary hose to an on-site potable water source, and route the hose to the outlet of liquid-phase GAC vessel T-102. Open AP-111 and fill T-102; then move the hose to the outlet of liquid-phase GAC vessel T-103. Open AP-111 and fill T-103; then disconnect the hose and reconfigure the GAC piping to the original position.
- Connect the temporary hose to the oil-water separator (T-100) manway. Begin filling the oil-water separator plate pack chamber. **Do not** fill the oil reservoir chamber.

- The water level in the oil-water separator should rise to allow water to flow from the plate pack chamber to the surge tank chamber. Continue filling T-100 until pump P-100 energizes (at the LSH-100 set point). At the time of pump energization, cease filling the oil-water separator. Pump P-100 should withdraw fluid from the surge tank chamber of T-100 sufficiently to drop the liquid level below the LSL-100 set point. At this point, P-100 should de-energize. Fluid from P-100 may be of a sufficient volume to flood particulate filters F-101A/B and begin filling treated water storage tank T-104.
- Refill the oil-water separator until P-100 energizes. While P-100 is operating, manually operate the oil-water separator level switch LSHH-100. Verify the presence of an alarm signal.
- Remove the cover from pressure switch PSH-100. While P-100 is operating, manually operate the contacts on pressure switch PSH-100. Verify the presence of an alarm signal. Replace the cover.
- Remove the cover from pressure switch PSHH-100. While P-100 is operating, manually operate the contacts on pressure switch PSHH-100. Verify the presence of an alarm signal and the automatic de-energization of pump P-100. Replace the cover.
- Observe the differential pressure across particulate filters F-101A/B via PDI-100. Record this data.
- Slowly close HV-111. Verify the de-energization of pump P-100 and the presence of an alarm signal. Open HV-111.
- Position hand switches HS-100 (pump P-100), HS-101 (pump P-101), and HS-102 (pump P-102) to their "off" positions.
- Verify that the plate pack chamber in T-100 is full, and remove the potable water fill hose from the T-100 manway. Replace the manhole cover and tighten the hold-down bolts.
- Return hand switches HS-100 (pump P-100), HS-101 (pump P-101), and HS-102 (pump P-102) to their "auto" positions.
- Position hand switch HS-400 to the "auto" position. Position hand switch HS-402 to the “Air Compressor-A” position, and place K-410, the SM-11, in the remote on/off active mode. Compressor K-410 should start. Open the drain valves on receiver T-400 (HV-414) and F-401 for 10 seconds each to exhaust any water or particles.
- Position hand switch HS-401 to the "auto" position.
- **NOTE**: At this point in the start-up, all permissive interlocks to compressed air flow control solenoid valve FCV-400 are made.
- As free product collects in the oil-water separator, transfer pump P-102 will energize as the contacts to level switch LSH-103 are made. Observe the operation of the pump and record the cycle time during which the pump remains energized.

Pump P-102 should de-energize when the product chamber of T-100 is empty and a low flow condition is detected by FSL-102.

- During pump P-102 operation, manually operate free product storage tank (T-101) high level switch LSHH-102. The following should occur:
  - Pump P-102 should immediately de-energize and an alarm should sound.
  - Flow Control Valve FCV-400 should immediately close.
  - Flow, as measured at FE-100 (1-inch-FP-111-PVC-I) should halt within 10 seconds.

- Position hand switch HS-201 (heat exchanger fan X-200) in the "auto" position. X-200 should energize only if the temperature at TSHL-200 is greater than 120 F. If X-200 energizes, return hand switch HS-201 to the "off" position and investigate and resolve the power or control cable error prior to proceeding further.
- Position hand switch HS-202 (transfer pump P-200) in the "auto" position. Pump P-200 should not energize, but should be in a "ready" mode awaiting fluid from air-water separator T-200. If P-200 energizes, return hand switch HS-202 to the “off” position and investigate and resolve the power or control cable error prior to proceeding further.
- Verify that HV-201 through HV-208 and HV-217 are fully open and HV-209 is fully closed. Place hand switch HS-200 (vapor extraction blower V-200) in the "auto" position. Blower V-200 should energize.
- Slowly open the main header throttling valve HV-209 while closing the dilution valve HV-217. Monitor the vapor concentration at AP-209 and continue to manipulate these valves until the flow rate and vacuum in the main header, as detected by FE-209, FE-210, FE-212, PI-209, PI-210, and PI-212 are at the required conditions.
- Adjust each extraction well isolation valve while monitoring the pressure indicators in each well to attain the desired vacuum balance across the wells.
- Remove the cover from high-level switch LSHH-200. While blower V-200 is operating, manually operate the contacts on level switch LSHH-200. The vapor extraction blower should immediately de-energize and an alarm signal sound. Replace the cover.
- Position hand switch HS-201 (extraction heat exchanger fan X-200) to the "off" position. V-200 should immediately de-energize and an alarm should sound. Reposition HS-201 to the "auto" position; V-200 should restart and the alarm should become silent.
- Manually operate high temperature switch TSH-200. V-200 should immediately de-energize and an alarm should sound. Reset TSH-200; V-200 should restart and the alarm should become silent.
- During operation, condensate should collect in the air-water separator. Verify the operation of level controls in T-200 by operating high level switch LSH-200. P-

200 should energize. Pump P-200 should de-energize when the water level in T-200 goes below LSL-200.

- Verify that biovent wells valves and HV-320 are fully open and HV-317 through HV-319 and HV-321 are fully closed. Place hand switch HS-300 (bio-venting blower V-300) in the "auto" position. Blower V-300 should energize.
- **NOTE:** Vacuum blower V-200 must be operating for bio-venting blower V-300 to operate.
- Remove the cover from low flow switch FSL-300. While V-300 is operating, manually operate the contacts on flow switch FSL-300. The vapor extraction blower should immediately de-energize and an alarm signal sound. Replace the cover.
- Remove the cover from high temperature switch TSH-300. While V-300 is operating, manually operate the contacts on temperature switch TSH-300. The vapor extraction blower should immediately de-energize and an alarm signal sound. Replace the cover.
- Slowly open main header throttling valves HV-317, HV-318, HV-319, and HV-321 while closing dilution valve HV-320. Continue to manipulate these valves until the flow rate and pressures in the main header, as detected by FE-317, 318, 319, 320, and PI-317, 318, 319, 320 are at the required conditions.
- Adjust each bio-venting well isolation valve while monitoring their respective flow elements to attain the desired flow balance across the wells. Valves HV-317 through HV-321 may require adjustment to permit a lower header pressure, should throttling of individual injection points limit total desired flow.
- At no time should any header pressure rise above 15 psig. If a rise in pressure to greater than 15 psig occurs, throttle back on the appropriate valve (HV-317, HV-318, HV-319, or HV-312) five full turns. Once readjusted, reopen the appropriate valve slowly.
- Balance the flow to each injection well to the desired flow rate by manipulating the injection point throttling valves while monitoring the flow elements.
- Record the injection point temperatures at each injection well via the temperature gauges at each wellhead. Record the injection point pressures at each injection well via the pressure gauge at each well.

At this point, the integrated system-startup is complete and the system may be considered to be in full operational mode. Should the system be fully or partially de-energized, restart should proceed according to the steps outlined, after the prerequisites are re-verified. The responsible project engineer may elect to skip over start-up steps where interlocks and instrument controls are verified operable only in the event that system shutdown was not initiated by equipment malfunction or failure. In this case, re-verification of interlock operation, equipment rotation, and instrument function must be made according to the applicable steps in this procedure.

4.4 System Operation

During the operation of the system, the operator must perform the following tasks on a regular basis:

- Monitor the pressure and temperature at the air injection.
- Monitor flow in the air injection system headers.
- Control the supply of air to the system by adjusting the header throttling valves, as required.
- Monitor the pressure and temperature for each of the air injection wells, respectively.
- Monitor the air flow into each biovent being operated in the injection mode.
- Control air injection into the subsurface by adjusting throttling valves at each biovent being operated in the air injection mode.
- Monitor the compressed air supply pressure to the groundwater extraction wells at PI-400.
- Check the air compressor oil level.
- Monitor the vacuum and flow of the vapor extraction wells.
- Monitor the temperature of the effluent of the vacuum blower.
- Monitor the level of condensate in the air-water separator by inspecting the sight glass mounted on the exterior of the air-water separator.
- Monitor the total product pumped to the free product storage tank at FQI-100.
- Monitor the liquid level in the product reservoir at LI-100.
- Monitor the differential pressure across the duplex filters at PDI-100.
- Monitor the influent and effluent pressure at the particulate filters at PI-100 and PI-102, respectively.
- Monitor liquid treatment system effluent pressure and flow at PI-101 and FQI-101, respectively.
- Inspect all piping and components for leaks.
- Clean or replace filters for the compressed air system on particulate filters F-400 and F-401, as needed.
- Clean or replace filters for the bio-vent blower, F-300 and F-301, as needed.
- Clean or replace filter for the vacuum blower, F-200, as needed.
- Replace particulate filters F-101A/B in the duplex filters as needed.

4.5 System Shut Down

The entire system can be shut down manually or automatically. Manual shut down occurs by turning the control panel power switch and the various motor starters to the "off" position. Automatic shutdown occurs when a control device actuates to shut down an individual process or the entire system. If necessary, during emergencies, the entire system can be manually shut down to prevent exacerbating the situation.

Systematic shut down and alarm will occur under several conditions including, but not limited to the following:

- High level in product storage tank T-101 indicated by LSHH-102
- Failure of the air compressor or loss of service air pressure (per PSL-400)
- Failure of pump P-100 or indication of high pressure per PSHH-100
- High level in the oil-water separator (as indicated by LSHH-100 or LSHH-103)
- High level in treated water storage tank T-104
- Failure of condensate transfer pump P-200 or high liquid level in the air-water separator as indicated by LSHH-200
- High temperature of TSH 200 at outlet of blower
- Failure of pump P-101, P-102, blower V-200 or V-300 or air compressor K-400.

5.0 Maintenance

5.1 Maintenance

Maintenance of system components is imperative to ensure unsafe conditions do not develop and prevent inadvertent and costly failures during system operation. For the purpose of this manual, maintenance is divided into three types: routine, preventive, and corrective. Routine maintenance generally involves frequent monitoring and visual inspection of the equipment, and includes an awareness of items such as odors in the air, sudden changes in the sound of the operating equipment, visible breaks in piping, leaks detected by abnormal moisture accumulation or discoloration, or excessive vibrations of the equipment or the foundations. Preventive maintenance is performed on a scheduled basis, as specified by the vendor, to preserve and prolong the life of the system components. Typical preventative maintenance procedures include cleaning, lubrication, and inspection of the parts and components inside the equipment. Corrective maintenance primarily involves equipment repair following a failure.

Some system components may require maintenance more frequently than others. The time intervals for required maintenance specified in the preventative maintenance matrix are approximate, and actual operating hours should be taken into consideration when determining the intervals between required maintenance. In addition, continuously starting and stopping equipment will decrease the amount of operational hours the unit is capable of before maintenance is required.

It is imperative that all personnel performing preventive or corrective maintenance on any part of the system are familiar with the Site Health and Safety Plan. In addition, the operator shall refer to the manufacturer's O&M manual found in Appendices C and D of this 2002 O&M Manual Update and in the original O&M Manual for equipment-specific safety protocol.

5.1.1 Bio-Vent System

5.1.1.1 Piping

Note: no modifications apply to this section. The text of this section can be found in the original O&M Manual.

5.1.1.2 Valves

Note: no modifications apply to this section. The text of this section can be found in the original O&M Manual.

5.1.1.3 Wellheads

Note: no modifications apply to this section. The text of this section can be found in the original O&M Manual.

5.1.1.4 Gauges

Note: no modifications apply to this section. The text of this section can be found in the original O&M Manual.

5.1.1.5 Bio-Vent Blower

Note: no modifications apply to this section. The text of this section can be found in the original O&M Manual.

5.1.2 Groundwater and Product Recovery System

5.1.2.1 Total Fluid Recovery Pumps

Note: no modifications apply to this section. The text of this section can be found in the original O&M Manual.

5.1.2.2 Oil-Water Separator (T-100)

Note: no modifications apply to this section. The text of this section can be found in the original O&M Manual.

5.1.2.3 Transfer Pumps (P-100, P-101, P-102)

Note: no modifications apply to this section. The text of this section can be found in the original O&M Manual.

5.1.2.4 Free Product Storage Tank (T-101)

Note: no modifications apply to this section. The text of this section can be found in the original O&M Manual.

5.1.2.5 Particulate Filters (F-100A/B)

Note: no modifications apply to this section. The text of this section can be found in the original O&M Manual.

5.1.2.6 Liquid-Phase GAC Units

Routine and preventive maintenance measures are described below.

- **Routine Inspection**. Note: no modifications apply to this section. The text of this section can be found in the original O&M Manual.
- **Preventive Maintenance**. Samples must be collected monthly from sampling ports in accordance with the NPDES permit compliance sampling program discussed in Section 6.0. The results of these samples will provide information regarding the performance of the GAC units, which must be reviewed by the project engineer. Upon indication of break-through of the first carbon vessel, the current lead vessel must be changed out, the second vessel must be valved in to become the lead vessel, and new carbon must replace the spent carbon in the first vessel. Carbon recharge must be virgin coconut-shell based activated carbon.

5.1.3 Vapor Treatment System

5.1.3.1 Air-Water Separator

Note: no modifications apply to this section. The text of this section can be found in the original O&M Manual.

5.1.3.2 Transfer Pump (P-200)

Note: no modifications apply to this section. The text of this section can be found in the original O&M Manual.

5.1.3.3 Vacuum Blower

Note: no modifications apply to this section. The text of this section can be found in the original O&M Manual.

5.1.3.4 Air Heat Exchanger

Note: no modifications apply to this section. The text of this section can be found in the original O&M Manual.

5.1.3.5 Vapor-Phase GAC Units (T-201 and T-202)

Routine and preventive maintenance measures are described below.

- **Routine Inspection**. During the weekly site visit, the GAC units must be checked for signs of leakage and corrosion in and around the piping connections to the tanks, associated valves, and associated gauges.
- **Preventive Maintenance**. Weekly effluent photoionization detector (PID) measurements must be collected in accordance with the SCAQMD permit compliance sampling program discussed in Section 6.0. These measurements will provide information regarding the performance of the VGAC units and must be reviewed by the project engineer. Upon indication of breakthrough of the lead tank, the second tank will be valved-in to become the lead tank. New carbon will replace the spent carbon in the former lead vessel. Vessel will be connected to take position as the second tank.

5.1.4 Compressed Air System

5.1.4.1 Air Compressor

Routine, preventive, and corrective maintenance measures are described below.

- **Routine Inspection**. The compressor oil level of each compressor must be monitored weekly and maintained at the proper level. A weekly check must be conducted for unusual noise or vibration of the each system as well. The units must be inspected at this time for proper V-belt tightness, properly operating safety valves, and intake filter cleanliness.
- **Preventive Maintenance**. During the weekly inspection, all dust and dirt must be cleaned off of the unit, and the air intake filters must be removed and cleaned, if required. At this time, the safety valves must also be checked to ensure that they do not stick. The automatic tank drain must be manually drained once a week, as well. The intercooler exterior and cylinder cooling fins must be cleaned at this time

The Kaeser SM-11 must be inspected, serviced, and maintained in accordance to the Kaeser SM-11 Screw Compressor Service Manual found in Appendix C. All warning and alarm notifications indicated by SIGMA CONTROL unit must be rectified through the appropriate service and maintenance procedures as indicated in the Screw Compressor Service Manual and the SIGMA CONTROL Service Manual.

During the monthly inspection of the Ingersoll-Rand compressor, the unit must be checked for leakage and for belt wear and adequate tension. The compressor oil must also be checked for contamination and be changed, if necessary. To prevent dirt accumulation, the motor windings must be blown off with compressed air at this time. The compressor's monthly preventative maintenance schedule also must include checking and cleaning (as required) the valves and regulator, tightening nuts and cap screws, checking the operation of the pressure relief valves, cleaning the air-cooled

aftercooler exterior, and checking the function of the automatic drain and the low oil monitor as detailed in the Ingersoll-Rand O&M manual found in Appendix C. At this time, the crankcase oil must be changed as specified in the Ingersoll-Rand instruction manual located in Appendix C, and the entire system must be checked for air leakage around fittings, connections, and gaskets using a soap solution and brush.

The ball bearing motor must be repacked with grease annually. During this annual overhaul, the intercooler tubes must be removed from their headers and inspected internally for signs of wear or buildup.

- **Corrective Measures**. Loss of air pressure, when the machine is idle and no air is being used, usually indicates that the check valve is not seating. This is caused by dirt or other foreign matter accumulating between the seat and disc. With the power off and the air drained from the tank, the check valve must be serviced by removing the valve, cleaning its interior, and checking the valve disc.

  If the motor fails to cut in, the oil level in the crankcase should be checked for adequate level. If the oil level is satisfactory, the malfunction is likely traceable to the automatic pressure switch, which may require replacement.

  If the low oil level switch is malfunctioning, it must be removed, cleaned, and tested prior to replacement. If the switch fails the test, the unit must be replaced.

5.2 Lubrication

Note: no modifications apply to this section. The text of this section can be found in the original O&M Manual.

5.3 Alarm Responses

Note: no modifications apply to this section. The text of this section can be found in the original O&M Manual.

6.0 Performance Monitoring

Performance monitoring is necessary to evaluate the effectiveness and efficiency of the system during operation. Some parameters measured as part of the performance monitoring effort will directly indicate if the system is performing inadequately, while others may suggest likely non-performance occurrences and their likely causes. Such parameters can be monitored by a direct reading field instrument and by periodic sampling and analysis of influent and effluent streams. Field instruments that constitute a part of the system instrumentation include liquid levels indicators, pressure and temperature gauges, and flow totalizers.

6.1 Operating Parameter Measurement

Part of the performance monitoring requirements are to measure and monitor the operating parameters of the system. These parameters include: pressure, temperature, and flow rates in the injection and extraction piping and wells, differential pressure across the duplex filters, and liquid levels in the various tanks. The monitoring of these parameters is performed weekly. Data must be recorded on the weekly monitoring log sheet provided in Appendix B. These sheets must be fully completed.

The following sections describe detailed monitoring requirements.

6.1.1 Bio-Vent System

Performance monitoring of the bio-venting system includes monitoring temperature, pressure, flow, and liquid levels.

- **Temperature**. Temperature is monitored in the air injection headers (TI-317 through TI-320) and at each individual well with an in-line temperature gauge.
- **Pressure**. Pressure is monitored within the injection system at each well and for the total system. Pressure is monitored to identify zones where flow is insufficient.
- **Flow**. A flowmeter has been installed in the air injection header lines (FE-317 through FE-320). In addition, flow elements have been installed at each injection well to reflect air injection rates. The data collected from these instruments help to ensure that the air is being dispersed properly throughout the vertical section of the subsurface and allow identification of potential air injection problems.
- **Liquid Levels**. The depth to groundwater and floating product thickness in the injection wells must be measured monthly in the product recovery wells. The

liquid levels are measured with an electronic interface probe (IP) capable of differentiating between petroleum product and water.

- The IP must be decontaminated after each use by washing in a solution of Alconox detergent and water. The well gauging data can be used to monitor the depth, shape, and areal extent of the groundwater capture zone, as well as changes in product thickness with time. The data must be recorded on well gauging forms contained in Appendix B.

6.1.2 Groundwater and Product Recovery System

Performance monitoring of the groundwater and product recovery system includes monitoring pressure, flow, and liquid levels.

- **Pressure**. A pressure gauge (PI-100) has been installed at the inlet to the particulate filters to provide pressure reading on the discharge of P-100. A pressure indicator (PI-102) has been installed at the outlet of the filters to allow the operator to check differential pressure. This parameter must be measured as a means to monitor the effectiveness of the filters and to indicate the need for filter replacements. PI-101, located at the effluent transfer pump outlet, indicates the total treated water effluent pressure.
- **Flow**. FQI-100 is a totalizing flowmeter that has been installed on the inlet to the product tank T-101. This gauge provides a total of product recovered from the extraction wells. This parameter must be monitored to evaluate the effectiveness of the total fluid recovery pumps and to ensure that the treatment system has sufficient capacity to remediate the extracted fluids.
- The totalizing flowmeters FQI-101 and FQI-500, at the effluent pump outlet will provide total treated water output to the storm drain and to the irrigation system respectively.
- **Levels**. An IP is used to measure the depth to liquid below the top of the tank. The volume of recovered product is determined by the tank gauging data and the dimensions of the tank. This information will be used to determine the rate of free product collection in order to schedule its removal for disposal.

6.1.3 Vapor Extraction and Treatment System

Performance monitoring of the vapor extraction and treatment system includes monitoring temperature, pressure, and flow.

- **Temperature**. Temperature gauges have been installed in the vapor outlet line of each vapor extraction well. In addition, a temperature gauge has been installed on the vapor extraction header (TI-209) to monitor vapor treatment system influent temperature, while TI-210 provides system effluent temperature.

- Temperature gauge TI-211 has been installed at the outlet of the vapor extraction blower to provide information regarding the need to cool the blower outlet stream prior to the stream's entrance to the GAC units. Cooling is provided, as needed, by the heat exchanger installed at the inlet of the GAC system.
- **Pressure**. Pressure gauge fittings have been installed on the vapor extraction lines located in each of the vapor extraction wells. These fittings provide data that are used for balancing the vacuum induced in each of the vapor extraction wells. PI-209 has been installed on the vapor extraction header to provide treatment system inlet pressure.
- **Flow**. Vapor extraction header flow elements (FE-209, FE-210, and FE-212) provide the vapor treatment system influent flow rate. A flowmeter (FE-211) has been installed at the outlet of the second GAC vessel to provide the treatment system effluent flow rate.

6.1.4 Compressed Air System

Performance monitoring of the compressed air system involves monitoring the pressure on the unit's output to the total fluid recovery pumps, and monitoring the alarm and alert log of Air Compressor A's (K-410) SIGMA CONTROL unit.

- **Pressure**. The compressor outlet pressure gauge (PI-400) monitors the unit output to the total fluid recovery pumps. These data are used to monitor the performance of all of the total fluid recovery pumps. Increases in pressure requirements to maintain a hydrogeologic capture zone may indicate that the pumps require maintenance.

6.2 Sample Collection and Analysis

A major portion of the monitoring effort is to continuously evaluate the overall system effectiveness in contaminant extraction and treatment. This is accomplished by periodic sampling and analysis of the water and air/vapor waste streams. Water and air sampling is also necessary to ensure compliance with the SCAQMD and NPDES permit conditions.

Samples must be collected from sampling ports installed upstream and downstream of the water and air treatment equipment. The sampling frequency, procedures, and analytical methods to be used are described below. Table 6-1 summarizes the compliance monitoring sampling plan.

6.2.1 Wastewater Sampling

Wastewater samples must be collected downstream of the liquid-phase GAC units on a weekly basis from a sampling port. This water is comprised of treated groundwater from the pumping wells and treated condensed water vapor from the vapor extraction system. The samples must be tested for total petroleum hydrocarbons (TPH), benzene, toluene, ethylbenzene, total xylenes (BTEX), ethylene dibromide, methyl tertiary butyl ether (MTBE), and oil and grease, in addition to the physical characteristics of temperature and pH. If test results of these constituents consistently show full compliance with the effluent limitations for at least three months, the frequency of testing can be reduced to a monthly cycle unless otherwise specified by the CRWQCB executive officer. However, the frequency of analysis must revert back to a weekly schedule should any of the monthly samples exceed effluent limitations.

In addition to the weekly effluent sampling described above, a sample must be collected each month from a midpoint sample port between the LGAC units. This sample must be tested for TPH, BTEX, and MTBE, and the results used to determine when breakthrough of the lead GAC vessel has occurred. Indication of such breakthrough must prompt the replacement of the lead unit with the second unit and replacement of the second unit with a fresh GAC vessel.

In addition to the weekly effluent and intermediate sample described above, a sample must be collected each month from the inlet sample port prior to the LGAC units. This sample must be tested for TPH, BTEX, and MTBE and the results used to determine the pounds of hydrocarbon removed from the subsurface.

Monthly samples of the system liquid effluent must be tested for total dissolved solids and turbidity and for the presence of chloride, sulfate, sulfides, and nitrogen.

Samples collected on a quarterly basis from the system effluent sampling port must be tested for suspended solids and settleable solids and analyzed for lead.

The annual system effluent sample must be analyzed for biological oxygen demand (BOD @ 20^{o}C) and toxicity. If the results of the annual toxicity test yield a survival rate of less than 90 percent, the frequency of analysis must be increased to a monthly schedule until at least three consecutive test results have been obtained and full compliance with NPDES effluent limitations have been demonstrated.

The samples must be collected by trained personnel in accordance with applicable EPA and RWQCB guidelines. The water samples must be placed in a cooler containing ice for delivery to the analytical laboratory. A chain of custody form must be completed for each set of samples; and must accompany the samples to the laboratory. The samples must be analyzed and the results reported within five business days of sample receipt at the analytical laboratory.

6.2.2 Air Sampling

Air samples must be collected on a weekly basis upstream and downstream of the vapor-phase GAC units (T-201, T-202) and from between the GAC units at. These samples must be field screened for VOC concentrations using a photoionization detector (PID) calibrated to hexane. A VOC concentration in excess of 50 ppmv in the outlet of the primary (lead) GAC unit must prompt the replacement of the lead GAC unit with the second GAC unit and replacement of the second GAC unit with a fresh unit. All readings must be recorded on the weekly monitoring logsheet (Appendix B). Samples should be collected monthly from the inlet, intermediate, and outlet and tested for TPH and BTEX. These concentrations will aid in the determination of the mass of VOC removed during that time period.

7.0 Housekeeping and Waste Handling

Note: no modifications apply to this section. The text of this section can be found in the original O&M Manual.

8.0 Training

Note: no modifications apply to this section. The text of this section can be found in the original O&M Manual.

9.0 Record Keeping

9.1 Operations Documentation

9.1.1 System Parameters

The system operator(s) are responsible for the weekly monitoring of the system as described in Section 6.0. All data gathered must be recorded on the weekly monitoring log sheet for each system. An example of the form is included in Appendix B.

9.1.2 Well Elevation Data

Note: no modifications apply to this section. The text of this section can be found in the original O&M Manual.

9.1.3 Laboratory Data

Treated water effluent laboratory results are summarized in the monthly NPDES discharge monitoring reports. The original lab reports are kept in the project file.

9.1.4 Personnel

Note: no modifications apply to this section. The text of this section can be found in the original O&M Manual.

9.2 Maintenance Documentation

Note: no modifications apply to this section. The text of this section can be found in the original O&M Manual.

9.3 Waste Disposal Documentation

Records pertaining to waste disposal must be maintained in the project file. These records must include, but not be limited to, generator waste profiles, analytical results, waste manifests, bills of lading, waste acceptance or approval letters, and certificates of disposal. Telephone conversation logs and correspondence related to waste disposal also must be maintained in the central project files.

10.0 Operation Safety Manual

Revision to the operation safety procedures is beyond the scope of this 2002 O&M Manual Update. All activities related to the operation and maintenance of the pump area remediation system shall be conducted in accordance with the procedures documented in the current site specific health and safety plan (SHSP); and in compliance with all appropriate, or relevant and applicable corporate safety procedures and requirements, and with all federal, state, and local safety regulations.

TABLES

TABLE 3-1
Interlock List

Interlock	Description
I-1	Provides latching signal to main solenoid valve FCV-400 WHEN: • FCV-400 hand switch HS-401 is in AUTO position • Input latching signals are received from interlocks I-2, I-8 (or I-10), and I-9. IF HS-401 is taken out of "auto" or a delatching signal is received from any of the input interlocks, THEN I-1 will: • Close FCV-400, terminating compressed air supply to the extraction will pumps • Delatch I-4, terminating operation of the vacuum blower V-200.
I-2	Provides latching signal to start transfer pump P-100 WHEN: • P-100 hand switch HS-100 is in "auto" • An input latching signal is received from I-7 • Oil-water separator T-100 water level has reached the set point detected by LSH-100 • P-100 outlet flow is detected by FSL-100 • A high-high differential pressure condition across particulate filters F-100 and F-100B is not detected by PSHH-100 • T-104 water level is below the high-high level setpoint detected by LT-101. IF HS-100 is taken out of "auto," T-100 water level is detected by LSHH-100, or a delatching signal is received from I-7, THEN I-2 will: • Stop P-100, discontinuing water removal from T-100 • I-1 delatches, terminating compressed air supply to extraction well pumps • I-3 delatches, stopping P-200 and discontinuing fluid transfer from T-200 to the oil-water separator • I-8 and I-10 delatch, stopping air compressors K-400 and K-410. IF T-100 water level is detected by LSH-100, THEN I-2 will start P-100 IF T-100 water level is detected by LSL-100, THEN I-2 will stop P-100
I-3	Provides latching signal to start transfer pump P-200 WHEN: • P-200 hand switch HS-202 is in "auto" • An input latching signal is received from I-2 and I-9 • Air-water separator T-200 water level as detected by LSL-200 and LSH-200. IF HS-202 is taken out of "auto," T-200 water level is detected by LSHH-200, or delatching signals are received from either I-2 or I-9, THEN I-3 will: • Stop P-200, discontinuing water removal from T-200 • Delatch I-4, stopping V-200 IF T-200 water level is detected by LSH-200, THEN I-3 will start P-200 IF T-200 water level is detected by LSL-200, THEN I-3 will stop P-200
I-4	Provides latching signal to start vacuum blower V-200 WHEN: • V-200 hand switch HS-200 is in "auto" • An input latching signal is received from I-3 and I-5 • V-200 outlet temperature is not above the high temperature setpoint detected by TSH-200 • V-200 outlet flow is detected by FSL-200 • Air-water separator T-200 water level is not detected by LSHH-200. IF HS-200 is taken out of "auto" or delatching signals are received from either I-3 or I-5, THEN I-4 will: • Stop V-200, discontinuing extraction vapors from the subsurface • Delatch I-6, stopping bioventing blower V-300.

TABLE 3-1
Interlock List

I-4 (cont.)	IF outlet temperature becomes greater than 210°F as detected by TSH-200, THEN I-4 will stop operation of V-200 and delatch I-6, terminating operation of bioventing blower V-300 IF outlet flow is low as detected by FSL-200, THEN I-4 will stop operation of V-200 and delatch I-6, terminating operation of bioventing blower V-300 IF the water level in the air-water separator is high as detected by LSHH-200, THEN I-4 will stop operation of V-200 and delatch I-6, terminating operation of bioventing blower V-300
I-5	Provides latching signal to start air to heat exchanger X-200 WHEN: • X-200 hand switch HS-201 is in "auto" • Outlet temperature is greater than high temperature setpoint as detected by TSHL-200. IF HS-201 is taken out of "auto," THEN I-5 will: • Stop X-200, discontinuing cooling of the vapor stream • Delatch I-4, stopping vapor extraction blower V-200. IF outlet temperature is less than low temperature setpoint as detected by TSHL-200, THEN I-5 will stop X-200 to discontinue cooling of the airstream
I-6	Provides latching signal to start biovent blower V-300 WHEN: • V-300 hand switch HS-300 is in "auto" • An input latching signal is received from I-4 • V-300 outlet temperature is less than the temperature setpoint as detected by TSH-300 • V-300 outlet flow is greater than the low flow setpoint as detected by FSL-300. IF HS-300 is taken out of "auto," THEN I-6 will stop V-300, discontinuing injection of vapors into the subsurface IF outlet temperature becomes greater than the high temperature setpoint as detected by TSH-300, THEN I-6 will stop operation of V-300 IF outlet flow becomes less than the low flow setpoint as detected by FSL-300, THEN I-6 will stop operation of V-300
I-7	Provides latching signal to start discharge transfer pump P-101 WHEN: • P-101 hand switch HS-101 is in "auto" • Water storage tank T-104 water level has reached the high-level setpoint detected by LT-101 • P-101 outlet flow is detected by FSL-101. IF HS-101 is taken out of "auto," THEN I-7 will: • Stop P-101 • Delatch I-2, stopping transfer pump P-100. IF T-104 high-high water level is detected by LT-101, THEN I-7 will delatch I-2 IF T-104 high water level is detected by LT-101, THEN I-7 will start P-101 IF T-104 low water level is detected by LT-101, THEN I-7 will stop P-101 IF the irrigation control relay is active, T-104 water level is below the high-high setpoint detected by LT-101, and T-104 water level is above the low setpoint detected by LT-101, THEN I-7 will start P-101 IF outlet flow is not detected by FSL-101, THEN I-7 will stop operation of P-101

TABLE 3-1
Interlock List

I-8	Provides latching signal to start air compressor K-400 WHEN: • Hand switch HS-400 is in "auto" position • Hand switch HS-402 is in "Air Compressor B" position • Air receiver tank T-400 pressure is less than the high pressure setpoint as detected by PSHL-400 • Latching signals are received from interlocks I-2 and I-9. IF HS-400 is taken out of "auto" or a delatching signal is received from any of the input interlocks, THEN I-8 will: • Stop K-400, discontinuing compressor operation • Delatch I-1, terminating compressed air to extraction well pumps. IF T-400 pressure is greater than the high pressure setpoint as detected by PSHL-400, THEN I-8 will stop K-400
I-9	Provides latching signal to start free product transfer pump P-102 WHEN: • P-102 land switch HS-102 is in "auto" • T-101 free product level is below the setpoint detected by LSHH-102 • Oil-water separator T-100 product level is below the setpoint detected by LSH-103. IF HS-102 is taken out of "auto," THEN I-9 will" • Stop P-102 • Delatch I-1, terminating compressed air to extraction well pumps • Delatch I-3, stopping pump P-200 • Delatch I-8 and I-10, stopping air compressors K-400 and K-410. IF T-100 product level is detected by LSHH-103, THEN I-9 will: • Delatch I-1, stopping compressed air to extraction well pumps • Delatch I-3, stopping pump P-200 IF T-100 water level is detected by LSH-103, THEN I-9 will start P-102 IF P-102 outlet flow is not detected by FSL-102, THEN I-9 will stop P-102
I-10	Provides latching signal to allow SIGMA CONTROL unit operation of air compressor K-410 WHEN: • Hand switch HS-400 is in "auto" position • Hand switch HS-402 is in "Air Compressor A" position • K-410 is set to "Remote ON" mode • K-410 is "ON" • SIGMA CONTROL unit is not in "Alarm" condition • Latching signals are received from interlocks I-2 and I-9. IF HS-402 is in the "Air Compressor A" position and IF HS-400 is taken out of "auto," K-410 is not set to "Remote ON," K-410 is not "ON", the SIGMA CONTROL unit goes into "Alarm" condition, or if delatching signals are received from I-2 or I-9, THEN I-10 will: • Stop K-401 • Delatch I-1, terminating compressed air delivery to extraction well pumps

TABLE 3-2
INSTRUMENT LIST

Groundwater Extraction System

INSTRUMENT	DESCRIPTION	MANUFACTURER	MODEL	RANGE
PI-100A&B	Transfer Pump P-100 Outlet Pressure	Ashcroft	Q8996	0-60 psig
PI-103	Carbon Vessel Inlet Pressure	Ashcroft	733-03	0-30 psig
PI-101	Discharge Pump P-101 Outlet Pressure	Ashcroft	723-08	0-100 psig
FQI-101	Treated Groundwater Quantity (Discharge to Storm Drain)	Neptune	47101307	0-30 gpm
LI-100	Level Sight Gauge Oil-Water Separator Product Reservoir	AT-A-Glance	Therma Gauge Type H	Empty to Full, 1/4 Tank Intervals
PI-104	Carbon Vessel Outlet Pressure	Dwyer	2001	0-1 H_2O
TI-100	Carbon Vessel Inlet Temperature	Trend	CR2204A	0-200^{o} F
TI-101	Carbon Vessel Outlet Temperature	Trend	CR2204A	0-200^{o} F
TI-102	Discharge Temperature After Pump P-101	Trend	CR2204A	0-200^{o} F
FQI-100	Free Product Totalizer	Kent Metron	95N000435	
FQI-500	Irrigation Discharge Totalizer	Neptune	T-10	0-9999999 Gals.
PI-500	Irrigation Discharge Line Pressure	Marsh		0-100 psig
FIT-100 (Total Fluids)	Influent Flowmeter/Totalizer	+GF+ Signet	3-2536-PO/ 3-8550-1	0-30 gpm (adjustable)
PT-100	Carbon Vessel Inlet Pressure Transmitter	Dwyer	634ES1-3	0-100 psig
LT-101	Treated Water Storage Tank Level Transmitter	Kobold	NEO-5001	0-10.5 feet (adjustable to 18 feet)
PI-501	Irrigation Manifold Treated Water Supply Pressure	March		0-100psig

TABLE 3-2
INSTRUMENT LIST

Vapor Extraction System

INSTRUMENT	DESCRIPTION	MANUFACTURER	MODEL	RANGE
	Wellhead Extracted Vapor Vacuum Indicators	Dwyer	2150	0-150 "H_2O
TI-209	Extracted Vapor Header Temperature (Inlet of T-200)	Trend	CR2204A	0-200^{O} F
PI-209	Extracted Vapor Header Pressure Guage	Dwyer (Pitot Tube)	2150	0-150 "H_2O
FE-209	Extracted Vapor Header Flow Indicator	Dwyer	Pitot Tube: DS-200-4, Gauge: 2002	0-2 "H_2O
FE-210	Extracted Vapor Header Flow Indicator	Dwyer	Pitot Tube: DS-200-4, Gauge: 2002	0-2 "H_2O
FE-211/FT 211	Stack Vapor Flowrate Element/Transmitter	Dwyer	Pitot Tube: DS-200-4, Gauge: 605A-6	0-6 "H_2O
TI-211	Temperature Indicator Discharge Vacuum Blower (outlet V-200)	Trend	CR2206E	0-300^{o} F
TI-212	Temperature Indicator Discharge Heat Exchanger (outlet X-200)	Trend	CR2204A	0-200^{o} F
TI-213	Temperature Indicator Discharge Carbon Vessels	Trend	CR2204A	0-200^{o} F
FE-212	Extracted Vapor Header Flow Indicator	Dwyer	Pitot Tube: DS-200-4, Gauge: 2002	0-2 "H_2O

TABLE 3-2
INSTRUMENT LIST

Bio-Venting System

INSTRUMENT	DESCRIPTION	MANUFACTURER	MODEL	RANGE
	Biovent Wellhead Temperature Indicators	Trend	CR3205	20-240^{o} F
	Biovent Wellhead Pressure Indicators	Ashcroft	723-03	0-30 psig
	Biovent Wellhead Flowrate Indicators	King Instrument Co.	75112215B-07	0-20 scfm
TI-317 to TI-320	Biovent Header Temperature Indicators	Trend	CR2211	0-250^{o} F
PE-317	Biovent Header Pressure Indicator	Ashcroft	723-03	0-30 psig
FE-317 to FE-320	Biovent Header Flowrate Indicator	King Instrument Co.	5848-256	0-20 scfm
PI-320	Biovent Blower Outlet Pressure Indicator	Marsh	16778	0-30 psig

Compressed Air System

INSTRUMENT	DESCRIPTION	MANUFACTURER	MODEL	RANGE
PI-400	Compressed Air Supply Pressure Indicator	Ashcroft	723-08	0-100 psig
PI-401	Compressed Air Receiver Tank Pressure	Ashcroft	593-13	0-300 psig
FE-400	Compressed Air Supply Flow Indicator	King		

TABLE 3-3
CONTROL DEVICE SETPOINTS

Groundwater Extraction System

CONTROL DEVICE	DESCRIPTION	SET POINT	MANUFACTURER	MODEL	RANGE
FCV-500	Storm Drain Discharge Solenoid	Energize to Close	Asco	8210G14	5-150 psig
FCV-501	Treatment Complex Irrigation Discharge Solenoid	Energize to Open	Asco	8210G4	5-150 psig
FCV-502	Irrigation Manifold Irrigation Discharge Solenoid	Energize to Open	Asco	8210G14	5-150 psig
FCV-503	Domestic Water Solenoid	Energize to Close	Asco	8210G4	5-150 psig
FSL-100	Transfer Pump P-100 Flow Low	Closes with Increasing Flow	Flotect	V4	
FSL-101	Transfer Pump P-101 Flow Low	Closes with Increasing Flow	Flotect	V6EPB BS3B	
FSL-102	Free Product Pump P-102 Discharge Flow Low	Closes with Increasing Flow			
FSL-500	Irrigation Discharge Flow Low	Closes with Increasing Flow	Flotect	V6EPB BS3B	
LSH-100	Oil-Water Separator T-100 Water Level High	Closes with Rising Level	Warrick Controls	Series FOE	
LSH-103	Oil-Water Separator T-100 Product Level High	Closes with Rising Level	Warrick Controls	Series FOE	
LSHH-100	Oil-Water Separator T-100 Water Level High-High	Closes with Rising Level	Warrick Controls	Series FOE	
LSHH-102	Free Product Tank T-101 Level High	Closes with Rising Level			
LSHH-103	Oil-Water Separator T-100 Product Level High-High	Closes with Rising Level	Warrick Controls	Series FOE	
LSL-100	Oil-Water Separator T-100 Water Level low	Closes with Rising Level	Warrick Controls	Series FOE	
PSH-100	Particulate Filters F-100 A/B Differential Pressure High	15 psid	Custom Control Sensor	604D2	6 - 75 psid
PSHH-100	Particulate Filters F-100 A/B Differential Pressure High-High	20 psid	Custom Control Sensor	604D2	6 - 75 psid
PSV-100	Discharge Pump P-101 Pressure Relief Valve		Plastomatic	RVDM	0-75 psig
PSV-102	Discharge Pump P-102 Pressure Relief Valve		McDonald(McMaster Carr)	4780K81	0-30 psid
PCV-500	Treated Water Irrigation Supply Pressure Regulator	30 psi	Watts Regulator	25AUB-LP SZ1	10 - 35 psig
	Reduced Pressure Back Flow Preventer		Watts Regulator	1" 009 M2QT	

Vapor Extraction System

CONTROL DEVICE	DESCRIPTION	SET POINT	MANUFACTURER	MODEL	RANGE
TSHL-200	Air-to Air Heat Exchanger X-200 Outlet Temperature High-Low	150/100^{o} F	Mercoid	DA-7035-153-4N	100 - 200^{o}F
FSL-200	Vapor Extraction Blower V-200 Outlet Flow Low	Closes with Increasing Flow	Flotect	V42U	
LSL-200	Air-Water Separator T-200 Water Level Low	Closes with Rising Level	Flotect	L6EPB SS3A	
LSH-200	Air-Water Separator T-200 Water Level High	Closes with Rising Level	Flotect	L6EPB SS3A	
LSHH-200	Air-Water Separator T-200 Water Level High-High	Closes with Rising Level	Flotect	L6EPB SS3O	
PSV-200	Vacuum Relief Valve - Vacuum Blower V-200		Knuckle Valve	215VH01	-15 "Hg
TSH-200	Vapor Extraction Blower V-200 Outlet Temperature High	210^{o} F	Mercoid	FM-437-153-3510	80 - 240^{o}F

TABLE 3-3
CONTROL DEVICE SETPOINTS

Bio-Venting System

CONTROL DEVICE	DESCRIPTION	SET POINT	MANUFACTURER	MODEL	RANGE
FSL-300	Bio-Vent Blower V-300 Outlet Flow Rate Low	Closes with Increasing Flow	Flotect	V42U	
PSV-300	Biovent Blower Outlet Pressure Relief Valve			14134	
TSH-300	Bio-Vent Blower V-300 Outlet Temperature High	210° F	Mercoid	FM-437-153-3510	80 - 240°F

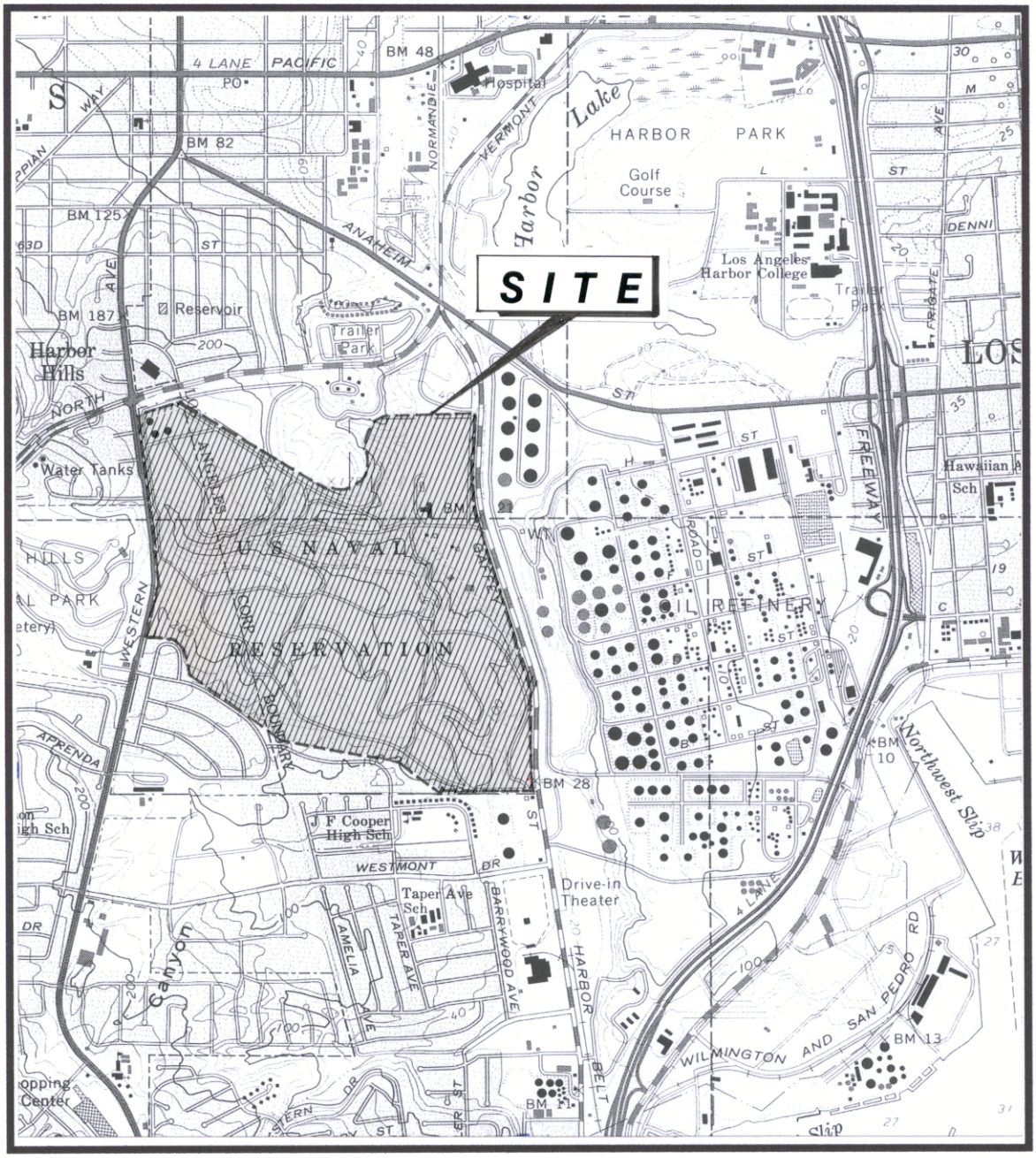
Compressed Air System

CONTROL DEVICE	DESCRIPTION	SET POINT	MANUFACTURER	MODEL	RANGE
PSL-400	Air Compressor Receiving Tank T-400 Air Pressure Low	45 psi Opens with Increasing Pressure	Square D	GHW5	
PSHL-400	Air Compressor Receiving Tank T-400 Air Pressure High-Low	175 psi/150 psi Opens with Increasing Pressure	Square D	GHW2	
PSL-410	Compressed Air Line Air Pressure Low	Closes with Increasing Pressure	Asco	PB21B	
FC-400	Compressed Air Supply Solenoid Valve		JD Gould Co	22134	120V - 1" dia 5-15 psi
PCV-400	Compressed Air Supply Pressure Regulator		Wilderson	CB6-02-FM0BG95	0-125 psig
PSV-400	Pressure Relief Valve		Knuckle Valve	548 A01 H95M	60 psig 325 psig
FC-401	Compressed Air Supply Discharge Solenoid Valve		Asco	8210G14	5-150 psig
LSL-400	Air Compressor B (K-400) Low Oil Level Switch		Frank W. Murphy	L971-B	

Table 6-1 COMPLIANCE MONITORING SAMPLING PLAN				
Sample Type	**Frequency**	**Location**	**Analysis**	**QC Samples**
Liquid-phase Granular Activated Caron (LGAC) effluent	Weekly*	GAC effluent sampling port AP-101	TPH by EPA 8015M BTEX and MTBE by EPA 8021B Ethylene dibromide by EPA 504.1 Oil/grease by EPA 413.2 Temperature PH	1 field duplicate per 10 samples
	Monthly		Chloride by EPA 300.0 Sulfates by EPA 300.0 Sulfides by EPA 376.2 Nitrogen by EPA 300.0 Total dissolved solids by EPA 160.1 Turbidity by EPA 180.1	1 field duplicate per 10 samples
	Quarterly		Total lead by EPA 7421 Settleable Solids by EPA 160.5 Suspended Solids by EPA 160.2	1 field duplicate per 10 samples
	Annually		Toxicity by LC50 Fish Bioassay BOD (20 deg C) by EPA 405.1	1 field duplicate per 10 samples
Vapor-phase Granular Activated Carbon (VGAC) influent, VGAC midfluent, and VGAC effluent	Weekly	Sampling ports AP-209, AP-210, and AP-211	VOCs by PID	
Groundwater	Semiannually*	Monitoring wells without measurable product	TPH by EPA 8015 Aromatic hydrocarbons by EPA602 Total lead by EPA 7421	1 field duplicate per 10 samples

*Note: The CRWQCB authorized reduction of effluent sampling schedule from weekly to monthly in a letter from J.E. Ross of the CRWQCB Site Cleanup Unit to Lt. Col Charles Gross, then Commander of Defense Fuel Region West (dated March 3, 1997). In the same letter the CRWQCB also authorized that the quarterly groundwater monitoring schedule be modified to coincide with the facility-wide semiannual groundwater sampling event.

FIGURES



REFERENCE: 7.5 MINUTE USGS TOPOGRAPHIC MAP OF
TORRANCE, CALIFORNIA QUADRANGLE
DATE: 1964 PHOTOREVISED 1981
SCALE = 1:24,000

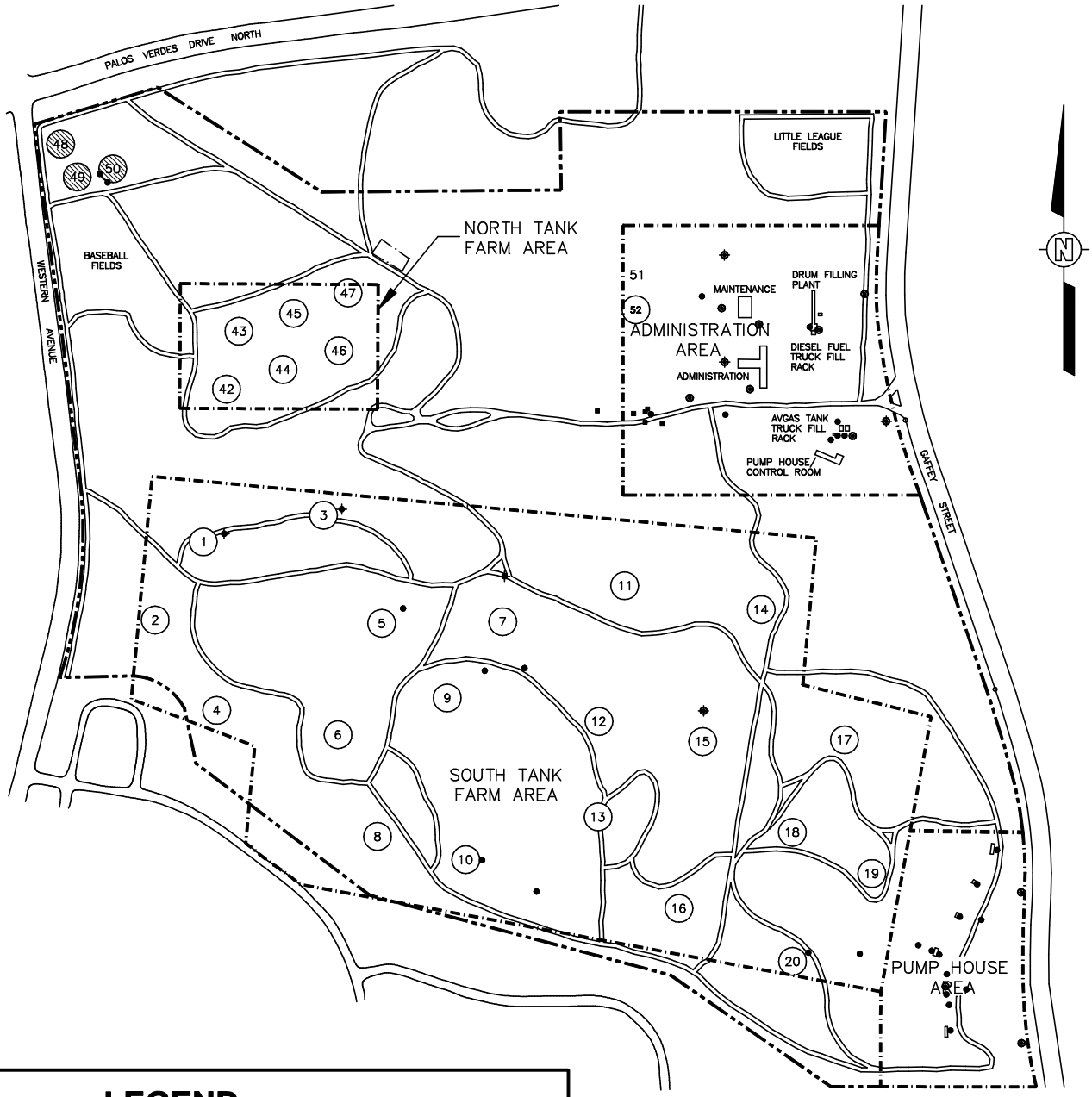
SCALE

0 2,000 4,000 FEET

GROUNDWATER TECHNOLOGY

SITE LOCATION MAP

CLIENT: D.F.S.P. SAN PEDRO	FILE: 781879-A1	PROJECT NO.: 781879	PM	PE/RG	
	REV.		FIGURE: 1		
LOCATION: 3171 NORTH GAFFEY STREET SAN PEDRO, CALIFORNIA	DES. D.S.	DET. MBM	DATE: 5-18-99		



LEGEND

- PROPERTY BOUNDARY
- AREA BOUNDARY
- (1) UNDERGROUND FUEL STORAGE TANK
- (50) ABOVEGROUND FUEL STORAGE TANK

GROUNDWATER TECHNOLOGY

SCALE 0 800 FEET

FACILITY MAP

CLIENT: D.F.S.P. SAN PEDRO	FILE: 781879-A2	PROJECT NO.: 781879	PM	PE/RG
	REV.			
LOCATION: 3171 NORTH GAFFEY STREET SAN PEDRO, CALIFORNIA	DES. D.S.	DET. MBM	DATE: 5-18-99	FIGURE: 2

APPENDICES

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CONSTRUCTION RECORD DRAWINGS

APPENDIX B
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APPENDIX C
NEW VENDOR CATALOG INFORMATION FOR MECHANICAL PROCESS EQUIPMENT

APPENDIX C-1
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APPENDIX C-3
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APPENDIX E
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APPENDIX F
NEW MATERIAL SAFETY DATA SHEETS (MSDS)

GROUNDWATER TECHNOLOGY GOVERNMENT SERVICES

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OPERATION & MAINTENANCE MANUAL
PUMP HOUSE AREA REMEDIATION SYSTEM
DEFENSE FUEL SUPPORT POINT SAN PEDRO
CONTRACT #DLA600-92-C-5243
TASK ORDER ACO-0013
SAN PEDRO, CALIFORNIA

GROUNDWATER TECHNOLOGY GOVERNMENT SERVICES, INC.
Project # 871185

January 29, 1997

Prepared for

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Figures

Tables

Appendices

Neptune Type S Flowmeter O&M Instructions
Neptune Type S Flowmeter Parts List
Plast-O-Matic Relief Valves Installation Instructions
G&L Model SSV Pump I, O, & M Instructions
G&L Shaft Seal Replacement Instructions for SSV Pump
Liquid Phase GAC Unit Drawing

C-3 Vapor Extraction and Treatment System Equipment
Xchanger Heat Exchangers I, O, and M Instructions
Barnebey & Sutcliffe Vapor Phase GAC Unit Drawing

C-4 Compressed Air System Equipment
Ingersoll Rand Air Compressor Instruction Manual
Ingersoll Rand Air Compressor Parts List
Ingersoll Rand Low Oil Level Switch Technical Manual Supplement
Ingersoll Rand Air Filters O, I, & M Instructions
Ingersoll Rand Auto Condensate Drain Trap Kit Parts List
Air Compressor Motor Starter Spec Sheet (has Danny Adams name)
Ingersoll Rand Electrical Schematic
Ingersoll Rand Synthetic Lubricant Technical Manual Supplement
Ingersoll Rand Directory of Full Service Distributors

Appendix D Vendor Catalog Information For Electrical & Control Equipment
APC Powercell User's Manual
Allen Bradley SLC 500 I&O Manual
Allen Bradley SLC 5/03 and 5/04 Memory Module Installation Instructions
USRobotics Sportster Modems Installation and Troubleshooting Guide

Appendix E Soil Boring Logs, Analytical Data, and Permits
Appendix F Material Safety Data Sheets (MSDS)
Appendix G Hydrostatic and Pneumatic Test Procedures

1.0 INTRODUCTION

This manual describes the operation and maintenance of the Defense Fuel Support Point (DFSP) San Pedro pump house area remediation system designed to remove petroleum hydrocarbons from the soil and groundwater underlying the pump house area of the site. Previous site investigations have led to the discovery of adsorbed-phase, dissolved-phase and liquid-phase hydrocarbons present in the subsurface soils and groundwater. As part of this project, a total of eight fluid and vapor recovery wells and 16 bio-venting wells have been installed to remove contaminated water, vapor, and product and inject oxygen into the subsurface. Additionally, the project consists of the construction, fabrication, and installation of groundwater and vapor treatment systems, including remediation equipment, piping, foundations, valves, electrical and control distribution systems, and other supporting equipment.

The system was designed and installed at the DFSP in San Pedro, California, for the Defense Fuel Supply Center (DFSC) under contract DLA600-92-C-5243, Task Order ACO-0013.

1.1 Purpose

This operation and maintenance (O&M) manual is a guiding document for the bio-venting and free product/vapor extraction treatment systems installed at the DFSP. The manual includes information pertaining to the operation and maintenance of the treatment facility equipment and systems, regulatory and permitting requirements, performance monitoring, health and safety procedures, and waste handling. The O&M manual is supplemented with equipment manufacturer O&M manuals, catalogs, cut sheets, and other technical data that provide information pertinent for operating, maintaining, and troubleshooting individual equipment components and systems.

1.2 Organization of the O&M Manual

To provide the background, technical basis, procedures, and administrative requirements necessary to operate and maintain the treatment facility, the O&M Manual has been organized into the following sections:

- ***Section 1.0, Introduction,*** provides a general introduction of the project, O&M Manual, site history, and remediation design and update requirements.
- ***Section 2.0, Regulatory Requirements and Permits,*** summarizes the regulatory basis for performing the project and provides the effluent water and air permits required for system operation.
- ***Section 3.0, Process and Equipment Descriptions,*** describes the bio-vent extraction and remediation equipment and systems that are installed.
- ***Section 4.0, Operation and Control Procedures,*** provides the procedures used to start up, operate, and shutdown the various equipment and systems.
- ***Section 5.0. Maintenance and Troubleshooting,*** includes manufacturer recommendations for maintaining the major equipment and procedures for troubleshooting and diagnosing failures.

- ***Section 6.0, Performance Monitoring,*** contains the operating parameters used to monitor system performance and the sampling and analysis needed to ensure effluent waste streams meet permit requirements.

- ***Section 7.0, Housekeeping and Waste Handling,*** outlines housekeeping and general upkeep requirements for the facility and requirements for storing, marking, transporting, disposing, and documenting of all liquid and solid wastes.

- ***Section 8.0, Training,*** provides direction on required OSHA, health and safety, and equipment training documentation.

- ***Section 9.0, Record keeping,*** provides direction on documentation of operation, maintenance, and waste disposal activities for the treatment facility.

- ***Section 10.0, Operation Safety Manual,*** provides the necessary health and safety guidelines for operation of the treatment system as a supplement to the existing Site Health and Safety Plan.

- ***Appendices*** contain the construction record drawings, pre-startup test procedures, manufacturer technical information, analytical data, permits, log sheets, and the system preventive maintenance schedule.

1.3 Site Description

DFSP San Pedro is located in San Pedro, California. The area where the remediation system has been constructed is located in the pump house area in the southeast corner of the site (figure 1). The pump house area is in a cleared, relatively level area and occupies approximately 15 acres. Several pump houses and valve pits for the on- and off-site distribution of fuels are located in the area. Fuels are transported via underground pipelines. A surface release of approximately 100,000 gallons of diesel fuel occurred in March 1979. Approximately 62,000 gallons of fuel reportedly were recovered at that time, but some fuel leaked into underlying soil and groundwater. Information provided by the DFSC indicates that diesel fuel is present below the subsurface.

Aquifer testing and sampling were conducted to evaluate subsurface conditions and determine the impact on the remedial design. The results indicate that a layer of free product up to 12 feet thick exists on top of the water table in the pump house area.

1.4 Remediation System Design

The remediation system at the San Pedro pump house area site effectively combines a number of remedial technologies into an integrated complex. In addition, further attributes are included in the design to enhance the effectiveness of the processes contained within it. The technologies utilized in the design include:

- groundwater recovery and treatment to remove free and dissolved diesel fuel and suspended solids

- groundwater withdrawal to maintain hydraulic control of the site to mitigate migration of the contamination plume
- air injection to stimulate indigenous bacteria to degrade organic compounds within the subsurface
- vacuum vapor extraction to remove volatilized water and organic compounds from the subsurface for further treatment and to remove injected air
- liquid stream separation to segregate aqueous and non-aqueous liquids
- granulated activated carbon (GAC) adsorption to remove residual organic compounds in both vapor and liquid streams

All of the equipment functions are integrated into a Programmable Logic Controller (PLC) which monitors and directs the energization, modulation, and de-energization of every component within the complex. The PLC is supplemented by other mechanical controllers that typically are supplied by vendors with their fabricated equipment. The master PLC is capable of sensing all process parameters and taking action to optimize system performance on an ongoing basis. In addition, the PLC is programmed to suspend one, or even all, of the treatment processes should any problems develop during operation. Action to initiate cessation of treatment can be taken in less than one second once a signal to do so has been initiated or a desired critical operational parameter has not been met.

The PLC logic program (ladder logic) has been developed to establish safety as the primary directive. The logic basis demands treatment suspension, suspension of withdrawal of contaminated groundwater, suspension of air injection and vapor extraction, suspension of the discharge of effluent water, and the isolation of critical equipment in a fail mode. This directive, therefore, ensures that, in failure modes up to and including catastrophic equipment failures, no contaminated liquids are brought into or can escape from the treatment complex. Any volatilized gases or vapors within the process piping and equipment are removed and captured prior to total complex shutdown.

1.5 O&M Manual Updates

The O&M manual is organized to support system operation and facilitate equipment troubleshooting and repairs. The design basis for each component is discussed, and information provided by equipment vendors is included. Information obtained during start-up testing and system operation has been incorporated into this O&M Manual. Because process equipment may be upgraded or system operation improved, annual updates may be required.

2.0 PERMITS

2.1 Applicable Regulations

Regulations applicable to the operation and maintenance of the treatment system include the State Clean Air Act regulations and the State Waste Discharge Permit Program regulations. The Clean Air Act regulations apply to air emissions from the treatment system and are administered by the South Coast Air Quality Management District (SCAQMD). The wastewater discharge regulations apply to the discharge of treated effluent to a local storm water drain and are administered by the California Regional Water Quality Control Board (CRWQCB), Los Angeles Region.

2.2 Regulatory Requirements

The treatment system operates under two regulatory permits: Permit to Construct/Operate, which establishes limits on air emissions, and a General National Pollutant Discharge Elimination System (NPDES) permit, which places limits on the quantity and quality of effluent water discharged to the storm drain. These regulatory requirements are discussed separately below.

2.2.1 Permit to Construct/Operate

The SCAQMD Permit to Construct/Operate (No. D92550) was issued to the DFSC on August 4, 1995 (Appendix E). The permit allows installation and operation of the vapor/groundwater extraction system subject to the conditions specified therein. Any system modifications that may alter the quantity or quality of air emissions must receive prior approval from SCAQMD.

The following permit conditions are relevant to field O&M activities:

1. Operation of this remediation system equipment shall be conducted in accordance with all data and specifications submitted with the application under which this permit is issued unless otherwise noted.

2. The equipment shall be properly maintained and kept in good operating condition at all times.

3. Upon completion, any vapor extraction well(s) and duct(s) shall be capped to prevent vapors from venting to the atmosphere. Vapors shall not be extracted from the soil unless vented to the vapor treatment system.

4. A flow indicator shall be maintained at all inlet streams to the vapor treatment system to indicate the total air flow rate in standard cubic feet per minute (scfm). The total flow rate shall not exceed 3,000 SCFM. In case a pressure sensor device is used in place of the flow indicator, a conversion chart shall be available to indicate the corresponding flow rate, in SCFM, to the pressure reading.

5. Current contact person name, company, and phone number shall be displayed in a permanent and conspicuous position.

6. This equipment may be used to extract and treat the vapors from chlorinated petroleum hydrocarbon contaminated soil.

7. Volatile organic compound (VOC) concentration shall be measured at the inlet and outlet of the primary and secondary adsorbers at least once every week by using a flame ionization detector or a district approved organic vapor analyzer calibrated in parts per million by volume (ppmv) of hexane (if other calibrating agent is used, it shall be correlated to and expressed as hexane).

8. VOC concentration measured at the outlet of the secondary adsorber shall not exceed 50 ppmv.

9. Whenever the VOC concentration at the outlet of the secondary adsorber exceeds the level in condition No. 8, the carbon in the primary and secondary adsorbers shall be replaced with fresh carbon from the manufacturer.

10. Records shall be maintained to prove compliance with conditions No. 4, 7, 8, and 9. The records shall be kept for the most recent two-year period and shall be made available to the district upon request.

Plans for system performance and compliance monitoring are detailed in section 6.0.

2.2.2 NPDES Permit

The treatment system effluent water is discharged directly to a local storm water drain via a concrete- lined drainage system and, ultimately to the southwest slip of Los Angeles Harbor. NPDES Permit No. CAG834001 was issued July 24, 1995 for the treatment system, in response to the DFSC application dated May 10, 1995. Requirements for the treated water discharge are set forth in the NPDES permit Waste Discharge Requirements (appendix E). The treatment system design includes remediation equipment capable of reducing effluent concentrations below the maximum allowed limits. Based on expected influent hydrocarbon concentrations of less than 20,000 ppm, the outlet from the oil-water separator should be less than 15 ppm. Final treatment by the GAC should then reduce the effluent to less than 1 ppm. Analysis ports have been provided on the inlet and outlet of the various treatment equipment to monitor performance. Plans for system performance and compliance monitoring are detailed in section 7.0.

2.3 DFSC and Regulatory Contacts

The primary DFSC and regulatory contact is provided below:

Joe Traini
Defense Fuel Support Point San Pedro
3171 N. Gaffey Street
San Pedro, CA 90731
(310) 335–3090 ext. 106

Hugh Marley
State of California
California Regional Water Quality Control Board
Los Angeles Region
101 Centre Plaza Drive
Monterey Park, CA 91754-2156
(213) 266-7669

3.0 PROCESS AND EQUIPMENT DESCRIPTIONS

The overall objective of the remediation system is to remove adsorbed and liquid-phase petroleum hydrocarbons. The process involves injecting fresh air into the subsurface to increase the concentration of oxygen while applying a negative pressure to promote vapor flow into the center of the plume, and extracting free product and vapor from the ground. The waste streams are then treated prior to releasing clean effluent (water and air) into the environment. Drawing X-001 illustrates the various process flowpaths. Process treatment systems are utilized to:

- aerate subsurface contaminants to increase biodegradation
- extract contaminated groundwater, free product, and vapors
- separate aqueous and non-aqueous phase liquids
- remove dissolved volatile organic compounds (VOCs) with activated carbon treatment
- remove gas stream VOCs with activated carbon treatment
- store removed product for subsequent recycling or disposal

PROCESS TREATMENT SYSTEMS	
SYSTEM No.	**TITLE**
1	Bio-Venting
2	Groundwater and Product Recovery
3	Vapor Extraction and Treatment

Support systems provide power to the remediation equipment. These are used to:

- provide compressed air for the total fluid recovery pumps
- provide 480 volt and 240/120 volt electrical power for equipment and lighting
- control overall system operation via a Programmable Logic Controller PLC

SUPPORT SYSTEMS	
SYSTEM No.	**TITLE**
1	Compressed Air
2	Electrical Power
3	PLC

The support systems are required to operate and control the process treatment systems. Pneumatic and electrical power are used to run equipment. Control power integrates the systems to ensure untreated waste streams are not inadvertently released.

Applicable information for the installed components is contained in the construction drawings found in appendix A. Also, equipment-specific information has been incorporated into the following sections and can also be found in the vendor O&M manuals contained in appendices C and D.

3.1 Bio-Venting System

3.1.1 System Description

The bio-venting system consists of an injection bio-vent blower, intake filter and silencer, pressure relief filter and silencer, 16 bio-vent wells, and associated instruments, controls, and piping. This system injects approximately 240 scfm of air into the 16 bio-vent wells (via three 3-inch-diameter headers) in order to stimulate biological activity in the treatment zone. The air entering the positive displacement bio-vent blower is drawn from ambient conditions, compressed, and then is distributed to the individual bio-vent wells via one of three headers. The bio-vent wells are located in a defined pattern across the site based upon air dispersion effectiveness to equally disperse the air. Refer to drawing G-001 for the well locations.

3.1.2 Major Equipment

3.1.2.1 Bio-Vent Wells. Sixteen air injection wells (IW-1 through IW-16) are installed around the extraction wells, as shown in drawing G-001, to a depth of approximately 25 feet below ground surface (ft bgs). Each injection well consists of a 4-inch-diameter, schedule 40 PVC casing, with 20 foot long PVC screens (drawing W-001). The screened intervals are set within the contaminated zones so that air will be directed into the upper surface of the water table and through contaminated soils. The screens have 0.02-inch slots surrounded by a No. 2/12 sand pack. Each well is sealed by a 2 foot minimum bentonite well seal to prevent vertical migration within the well casing. For more detail, refer to the boring logs contained in appendix E.

3.1.2.2 Wellheads. Each injection wellhead consists of a 1-inch flexible hose, flow element, temperature gauge, pressure gauge, and isolation valves connected to a PVC manifold. The manifold then connects to a carbon steel header. Unions, couplings, hose barbs, and other fittings are used to make the connections. Drawing W-001 contains wellhead details.

3.1.2.3 Bio-Vent Piping. Three 3-inch headers are used to direct air from the bio-venting blower into the injection wellheads (drawing X-002). Pressure and flow are controlled with throttling valves (HV-317 to HV-319) on each of the headers and individual throttling valves (HV-301 to HV-316) at each of the wellheads. All piping material, construction, and testing was performed in accordance with applicable provisions of ASME B31.1, Code for Power Piping. The header piping is constructed of schedule 40 galvanized steel, which changes to schedule 40 PVC approximately 15 feet from the treatment pad. Fittings, piping, and valves are either glued, threaded, or flanged.

3.1.2.4 Bio-Venting Blower. The bio-venting system accepts fresh air from the atmosphere through filter F-300 and silencer S-300 to the inlet of the bio-vent blower V-300. V-300 is a Roots model 36 URAI rotary lobe positive displacement blower that utilizes a 15 horsepower totally enclosed, fan cooled motor which requires 3 phase, 60 Hz, 230/460 volt power to operate. The blower delivers the air at approximately 12" inches of mercury inches of mercury (Hg) to the main discharge header. Pressure relief, if needed, is accomplished manually by throttling hand valve HV-320, which directs a portion of the pressurized air through filter and silencer F-301 to the ambient air.

3.1.2.5 Over-Pressure Protection. Pressure safety valve PSV-300 is located in the main header to serve as an emergency relief should any closure or combination of closures of hand valves HV-301 to HV-319 produce a main header pressure in excess of 15" Hg.

3.1.3 Functional Description

Individual flow elements FE-317, FE-318, and FE-319 are installed in each of the three headers to measure the flow of air to each header. These elements, in cooperation with valves HV-317, HV-318, and HV-319, are used to establish and balance the initial flow distribution of air to each of the three headers.

Approximately 15 scfm of air is delivered to each of the 16 bio-vent well points via individual 2 inch diameter ducts tapped off each header. The supply of air to each well point is controlled via hand- operated valves HV-301 to HV-316 at each respective well. Verification of flow is performed by connecting the flow element points to a field manometer or magnehelic gauge. Additionally, each injection well is equipped with a flow element (FE-301 through FE-316 installed in the supply ducts to wells IW-1 through IW-16, respectively) to aid in balancing air distribution. These elements consist of individual ball-type rotameters that indicate flow directly. Each rotameter has a throttling needle valve (HV-331 through HV-346) to adjust flow individually to each well. Hand valves (HV-301 to HV-316, normally throttled) in the air supply duct allow each well to be individually controlled, as well. Temperature and pressure of the air to the injection wells are monitored by temperature indicators TI-301 through TI-316 and pressure indicators PI-301 through PI-316.

Bio-vent blower V-300 is energized by a local control hand switch HS-300 which may either be placed in the "auto", "off", or "jog" position. When HS-300 is in the "auto" position or energization, bio-vent blower V-300 interlock I-6 is controlled by the permissive interlock described below:

INTERLOCK NUMBER	LOGIC
I-4	Hand switch HS-200 for vacuum blower V-200 must be in "auto" position.

No other system Interlocks receive permissive signals upon the locking of interlock I-6.

Upon de-energization of blower V-300 (via hand switch signal), the loss of the permissive interlock from I-4, the presence of an excessive discharge temperature (as detected by TSH-300), or a low flow condition (as detected by FSL-300)), injection of bio-vent air will cease.

3.2 Groundwater and Product Recovery System

3.2.1 System Description

Groundwater and free product are be removed by total fluid recovery pumps submersed near the groundwater table surface in recovery wells RW-1 through RW-8. These low volume (approximately 3 to 5 gallons per minute) pneumatic pumps were selected to minimize any emulsification of product and water. The pneumatic power for pump operation is supplied by the compressed air support system. Each pump discharges into a common header prior to entering the treatment compound. Flow is regulated by increasing or decreasing air head pressure via adjustment of PCV-400 or the manual inlet valves to each pump. The combined liquid stream then enters an oil-water separator which separates the fluid stream into water and oil fractions. Separated fuel is pumped out of the oil-water separator to a 500-gallon free

product storage tank, while approximately 5 gallons per minute (gpm) of water and dissolved fuel are pumped through a particulate filter and activated carbon to a 4,000-gallon storage tank. This tank provides temporary storage of the treated water before it is discharged to a remote concrete drainage ditch. Free product is stored in the free product storage tank for truck off-loading and recycling.

3.2.2 Major Equipment

3.2.2.1 Groundwater and Product Extraction Wells. Eight 4-inch-diameter, schedule 40 PVC-cased extraction wells (RW-1 through RW-8) were installed in the middle of the area as shown in drawing G-001 to a depth of approximately 50 ft bgs. The well screen interval is between 30 feet and 50 feet with 0.02-inch vee-wire slots surrounded by a silica sand pack. For more details, refer to drawing W-001 and the boring logs contained in appendix E. Total fluid recovery pumps (section 3.2.2.4) have been lowered within the well casing to the water table.

3.2.2.2 Wellheads. Each liquid extraction wellhead consists of one 3/4-inch flexible hose with an isolation valve and one 1/2-inch flexible air hose with an isolation valve. As shown in drawing W-001, the wellheads connect the discharge line for the total fluids recovery pumps to the main groundwater and product removal header. Unions, couplings, and other fittings are used to make the necessary connections. The extraction wellheads are located below grade in well vaults.

3.2.2.3 Groundwater and Product Piping. A 1-inch underground header will convey groundwater and free product from the extraction wells to the liquid treatment system (drawing X-002). The total fluid recovery pumps will discharge through 1-inch, schedule 40 PVC lines that connect to the main header through flexible hoses. All piping material manufacture, on-site construction, and testing was performed in accordance with applicable provisions of ASME B31.1, Code for Power Piping. Fittings, piping, and valves are either glued, threaded, or flanged.

3.2.2.4 Total Fluid Recovery Pumps. AutoPump^{R} AP-4/TL submersible, pneumatically operated, low volume, top-loading pumps (WP-101 through WP-108) supplied by Clean Environment Equipment were installed in each 4-inch extraction well casing to approximately 2 feet below the water table. These fiberglass pumps with stainless steel components remove contaminated groundwater and mobilized free product including particles up to 1/8 inch diameter. Because motive force is provided by compressed air, no electrical components are needed. Flow regulation is achieved by throttling the air pressure control valve (FC-400) or the manual inlet valves to each pump. Fluid enters the pump through a check valve located at the top. Pump operation occurs when a sufficient volume of fluid has accumulated in the collection chamber to force the float to actuate a limit switch. Compressed air (section 3.4) then enters a diaphragm which forces the fluid out the discharge of the pump. When the pump collection chamber has emptied, the float falls to its lower-most position and shifts the pneumatic valve to exhaust compressed air into the well casing. The pump fills again, and the cycle is repeated. The discharge rate automatically matches the well yield up to the capacity of the pump.

3.2.2.5 Oil-Water Separator. T-100 is the oil-water separator component of a CSEP^{TM} model 10 free product recovery system manufactured by Ameripure, Inc. The system is capable of handling up to 20 gpm of flow and storing 80 gallons of product and 207 gallons of water. The oil-water separator uses the following processes to remove oil from water:

- The two stack feet of coalescing plate allows buoyant forces to cause the oil droplets to rise until they attach themselves to the oleophilic polypropylene plates and form large globules that float to the surface.

- Two oil skimmers operate to transport the floating oil from the inlet chamber to the free oil holding compartment.

- A pump (P-102) withdraws oil that has accumulated in the oil holding compartment of the oil-water separator when actuated by a high- level switch.

- Clean water with some dissolved contaminants collect in clear well reservoir at the downstream side of the separator. Transfer pump P-100 then draws water from this reservoir and pumps the water through a particulate filter and granular activated carbon to the 4,000-gallon treated water storage tank.

3.2.2.6 Transfer Pumps. Transfer pump P-102 removes the product from the oil holding compartment when activated by a Warrick Controls series FOE sensor that has been incorporated into the CSEP™ recovery system. The pump is a gear pump.

The water transfer pump of the free product recovery system (P-100) is an Eastern Centrichem close coupled, end suction, centrifugal pump. The pump transfers water from the water holding compartment of the oil-water separator through the particulate filters and to the GAC units upon activation by a high-level switch(LSH-100).

Centrifugal transfer pump P-101 removes water from the 4,000-gallon treated water storage tank and discharges it to the storm drain under the authority of an NPDES permit (section 2.2). The pump is a Gould Pump Co. Model 1SVA vertical 4-stage pump that is capable of providing approximately 15 gpm at 140 feet of head. The 1-hp totally enclosed, fan cooled pump motor is supplied with 240 volt, 2 single phase, 60 hertz power. The pump is activated and de-energized by the storage tank high- and low- level switches LSH-101 and LSL-101. These switches are also Flotect™ model L-6 float switches.

3.2.2.7 Particulate Filters. Two Rosedale model 8 particulate filter systems (F-100A/B) were installed on the oil-water separator outlet to remove particulates greater than 20 microns in size. The filters are 99 percent efficient. Only one filter is valved in at any time, with the other remaining in standby. Loading is monitored by a differential pressure gauge (PDI-100). Upon indication of excessive buildup (a differential pressure reading approaching 15 psig), manual action is taken to replace and realign the filters to continue system operation. Filter bags allow easy removal and replacement.

3.2.2.8 Liquid Phase GAC Vessels. Two GAC vessels (T-102 and T-103) treat the liquid stream prior to discharge. These vessels contain a matrix of activated carbon screens through which the water stream passes. Due to the nature of activated carbon, a very small quantity exhibits a very large surface area (typically 1 acre per gram of mass). Passing the contaminated stream over the matrix of carbon exposes the small fraction of residual VOC-laden water to this large surface area of carbon where the compounds are captured by the carbon macro, micro, and meso pore matrix. The compounds remain captured within the carbon matrix until such time that the vessels are removed from the complex and the carbon is

regenerated. The liquid treatment vessels are filled with 800 pounds of virgin coal-based carbon and are capable of handling up to 25 gpm with 100 psig maximum flow and pressure. The vessels are arranged and operated in series flow only. The treated water is discharged to a concrete drainage ditch under authority of an NPDES permit (section 2.2).

3.2.3 Functional Description

The main solenoid valve FC-400 of the compressed air system controls the supply of influent groundwater into the treatment complex as delivered by the in-well pneumatic pumps (WP-101 through WP-108). Control of influent water is accomplished by controlling compressed air flow to the in-well pumps, thus preventing untreated water from entering the treatment complex unless the water treatment system is fully operational. Refer to the compressed air system functional description section 3.4.3 for a description of controlling interlocks and failure modes for solenoid valve FC-400. The de-energization of solenoid valve FC-400 effectively stops the delivery of liquid to the treatment complex; however, processing and treatment of liquids already delivered to the system may proceed independent of the position of this valve.

Free product that collects within the oil-water separator (T-100) is removed to the dual contained free product storage tank (T-101) by positive displacement transfer pump P-102. Transfer pump P-102 is energized upon the detection of a high free product level in the reservoir of the oil-water separator by high level switch LSH-103. The liquid removal logic is intended to totally drain the reservoir, with pump de-energization controlled by the indication of low discharge flow as detected by flow switch FSL-102. Failure of the pump to energize, thus producing a rising free product reservoir level, initiates an alarm via high high level switch LSHH-103, and the loss of latching signals to interlocks I-1 and I-3, thus suspending the delivery of liquids to the system. Indication of a high high free product level in the free product storage tank, via LSHH-102, initiates similar action.

Transfer pump P-102 requires no permissive interlocks for energization. However, hand switch HS-102, which control the energization of the pump, must be placed in it's "auto" position to provide permissive interlock latching signals through its interlock, 1-9 to the equipment listed below:

INTERLOCK NUMBER	LOGIC
I-1	Latching signal to main solenoid valve FC-400, permitting compressed air to be delivered to well pumps WP-101 through WP-108.
I-3	Latching signal to transfer pump P-200 permitting liquid discharge into the oil-water separator T-100 from the air-water separator T-200.

Transfer pump P-102 is protected from over-pressurization by discharge pressure safety valve PSV-102, which directs high pressure liquid to the pump's suction should isolation valve HV-100 be closed inadvertently.

Removal of separated water from the oil-water separator is done via centrifugal transfer pump P-100. Indication of high water level in the oil-water separator's water reservoir via level switch LSH-100 initiates energization of transfer pump P-100, while de-energization is initiated via indication of low liquid level by level switch LSL-100. Failure of pump P-100 to remove these liquids due to equipment malfunction or the inadvertent closure of subsequent valve, (thus giving rise to an increasing water level within the oil-water

separator as detected by high high level switch LSHH-100) initiates an alarm condition and de-energizes the groundwater extraction and treatment system. To be present for energization transfer pump P-100 requires the permissive interlock signal as outlined below :

INTERLOCK NUMBER	LOGIC
I-7	Permissive latching signal from transfer pump P-101, indicating that pump hand switch HS-101 has been placed in its "auto" position and that T-104 is not full as detected by LSHH-101.

Energization of transfer pump P-100 is via hand switch HS-100. Its energization initiates permissive interlock latching signals to equipment through its Interlock I-2, as shown below.

INTERLOCK NUMBER	LOGIC
I-1	Latching signal to main solenoid valve FC-400, permitting compressed air to be delivered to well pumps WP-101 through WP-108.
I-3	Latching signal to transfer pump P-200, permitting liquid discharge into the oil-water separator T-100 from the air-water separator T-200.

Transfer pump P-100 is protected from dead head conditions, or low flow operation energization, via flow switch FS-100. Pressure indicators PI-100A and PI-100B were installed downstream of the pump, prior to the particulate filters F-101A and F-101B, for visual verification of pump discharge pressure.

Indication of the differential pressure across, and the need to change (via audible alarm) either particulate filter (F-100A/B) cartridges is obtained via differential pressure indicator PDI-100, and PSH-100 respectively. Filter elements are changed upon a 15 psig differential pressure indicated across either filter. A high high differential pressure switch PSHH-100 was installed parallel to PSH-100 to protect the system from contamination should any loaded filter not be changed, thus risking filter bag failure. An indication of high high differential pressure (via pressure switch PSHH-100), initiates an alarm condition and de-energization of transfer pump P-100 via Interlock I-2.

Switch over to direct flow through filter F-101B from F-101A is accomplished by manual manipulation of inlet hand valves HV-115 and HV-113 and outlet hand valves HV-116 and HV-114.

Discharge of liquid from the particulate filters enters liquid phase GAC vessel T-102. An analysis port AP-113 was installed by which to take water samples for comparison to samples taken from analysis port AP-110 (which was installed at the discharge to the second GAC vessel T-103). Analysis port AP-111 was installed between the vessels to check for breakthrough of the primary carbon vessel. Each carbon vessel is equipped with camlock entry/discharge nozzles to expedite removal and installation.

The level within treated water storage tank T-104 may be visually verified by marks on the side of the tank. Removal of water from the tank by transfer pump P-101 is accomplished by indication of high liquid level in the tank via LSH-101. De-energization of pump P-101 is automatically achieved upon the removal of water from T-104 to a low level elevation via level switch LSL-101 through interlock I-7.

Failure of transfer pump P-101 to withdraw water from the water storage tank, giving rise to excessive fluid levels to a high high condition as detected by LSHH-101 will initiate the de-energization of pump P-101 and the entire groundwater extraction and treatment system through interlock I-7.

Transfer pump P-101 requires no permissive interlocks from other equipment for energization (through its interlock I-7). Control of interlock I-7 and energization of transfer pump P-101 is via hand switch HS-101. Energization of transfer pump P-101 initiates the permissive Interlock latching signals to the equipment through its interlock I-7, as outlined below.

INTERLOCK NUMBER	LOGIC
I-2	Latching signal to transfer pump P-101, permitting the energization of this pump via hand switch HS-100.
I-3	Latching signal to transfer pump P-200 permitting liquid discharge into the oil-water separator T-100 from the air-water separator T-200.

Transfer pump P-101 is protected from inadvertent dead head operating conditions, due to the blockage in subsequent piping or closure of discharge hand valve HV-122 or HV-123, by pressure safety valve PSV-100 connected between the pump's discharge header and the water storage tank. At discharge pressures greater than 125 psig, PSV-100 opens to relieve pump discharge to the water storage tank.

Analysis port AP-112 was installed downstream of PSV-100 to provide for ease of obtaining a water sample. Discharged water from P-101 is directed to a 2 inch under- and aboveground plastic pipeline to a concrete drainage ditch located to the northwest of the treatment area. The volume and rate of flow of the discharge exiting the treatment system are detected and recorded by turbine type rate and totalizing flow meter FE-101 and FQI-101. A regular comparison of volumes indicated by FQI-100 and FQI-101 give an indication of the volume of free product recovered by the system. Discharge pressure may be observed through pressure indicator PI-101, which is installed between analysis port AP-112 and flow meter FE-101.

3.3 Vapor Extraction and Treatment System

3.3.1 System Description

As a result of injecting 240 scfm of air to the subsurface, 240 scfm of residual air with entrained VOC vapors must be extracted via eight 50-foot-deep recovery SVE wells by a large vacuum blower. These wells are arranged at the inner perimeter of the bio-vent well's effectiveness zone. The collected VOC vapors are delivered to an air-water separator where entrained liquids are extracted from the stream, leaving vapors for treatment. These vapors then are cooled in a heat exchanger prior to being processed in two vapor-phase GAC vessels in series. Effluent from these vessels is discharged to the atmosphere. Residual liquids extracted from the stream are delivered to the oil-water separator of the groundwater and product recovery system for further processing.

3.3.2 Major Equipment

3.3.2.1 Vapor Extraction Wells. Eight 4-inch diameter, schedule 40 PVC-cased extraction wells (RW-1 through RW-8) were installed in the middle of the area (as shown in drawing G-001) to a depth of approximately 50 ft bgs. The wells are configured to extract both vapors and total fluids from each well. The well screen interval is between 30 feet and 50 feet with 0.02-inch vee-wire slots surrounded by a silica sand pack. For more details, refer to drawing W-001 and the boring logs contained in appendix E.

3.3.2.2 Wellheads. Each vapor extraction wellhead consists of a 4-inch by 2-inch reducing tee with vacuum gauges, and isolation valves. As shown in drawing W-001, the wellheads connect the vapor extraction lines in each bore hole to a 2-inch branch line that connects to the 4-inch vapor extraction header. Unions, couplings, and other fittings are used to make the connections.

3.3.2.3 Vapor Piping. Two 4-inch below grade headers transport contaminated vapor under vacuum from the extraction lines to the treatment compound (drawings X-001 and X-002). The header piping is constructed of schedule 40 PVC pipe. Fittings, piping, and valves are either glued, threaded, or flanged.

3.3.2.4 Air-Water Separator. A moisture knockout tank removes liquid, entrained moisture, and free product that is entrained in the vapor stream. In the air-water separator, the vapor stream is subjected to an abrupt change in flow velocity, which permits the removal of entrained liquid droplets from the stream. These droplets settle, and then coalesce, in the base of the separator and are removed when collected volume reaches a prescribed level by transfer pump P-200. P-200 controls the level by transferring fluid to the inlet of the oil-water separator for treatment with the other liquid streams. The air-water separator is located upstream of blower V-200 to prevent damage.

3.3.2.5 Transfer Pump. An Oberdorfer gear transfer pump (P-200) transfers liquid removed from the vapor waste stream in the air-water separator to the inlet of the oil-water separator for treatment with the extracted groundwater/and product stream. Three Flotect™ model L-6 level switches installed in the air-water separator control operation of P-200 via the PLC. These switches are UL and CSA listed and are FM approved for use in Class I, Groups A, B, C and D; Class II, Groups E, F, and G; and hazardous atmospheres (see appendix C for more electrical ratings).

3.3.2.6 Vacuum Blower. To draw vacuum on the wellheads, a 240-scfm Roots model 56 URAI rotary lobe, positive displacement blower (V-200) with an inlet filter was installed on the outlet of the air-water separator. The blower is capable of drawing a maximum vacuum of 11-inches Hg using a 20-hp motor with a 3-hp, 60-Hz, 230/460 volt power requirement. Filtered ambient air is also supplied, as needed, to cool the blower and dilute the vapor stream hydrocarbon concentrations entering the GAC vessels. A silencer has been installed downstream of the blower to reduce ambient noise levels.

3.3.2.7 Heat Exchanger. Due to compression, the temperature of the vapor stream rises as it is processed through the vacuum blower. An Xchanger, Inc. Model AA-500 air-to-air heat exchanger (X-200) was installed in the system downstream of V-200 to cool the influent airstream prior to its entrance to the first GAC vessel. Ambient air supplied by a ½-hp aluminum fan (V-200), is forced upwards over an aluminum plate fin core through which the contaminated vapor is flowing. The heat exchanger is rated for a 240-scfm process media flow rate with design inlet and outlet temperatures of 164°F and 92°F, respectively.

3.3.2.8 Vapor-Phase GAC Vessels. Two GAC vessels (T-202 and T-203) treat the vapor stream prior to discharge. The vessels are filled with 1,200 pounds of virgin coconut-based carbon. The treated air is discharged to the atmosphere under authority of a SCAQMD permit (section 2.3). Due to the low volatility of the diesel fuel at this site, the GAC requires very few regenerations.

3.3.3 Functional Description

When properly latched, vacuum blower V-200 energizes, extracts approximately 240 scfm of vapor from site soils, and provides motive pressure to process the airstream through an air-water separator, through the air-air heat exchanger (X-200), and through the two vapor-phase GAC vessels T-202 and T-203. Operation of the system via energization of V-200 is dependent upon the energization and acquisition of the permissive interlock latching signals, as outlined below.

INTERLOCK NUMBER	LOGIC
I-1	Hand switch HS-401 for energization (opening) of solenoid operated flow controller FC-400 must be in the "auto" position.
I-5	Hand switch HS-201 for air-air heat exchanger X-200 must be in the "auto" position.

Energization of vacuum blower V-200 initiates a permissive interlock latching signal to the equipment through its Interlock I-4.

INTERLOCK NUMBER	LOGIC
I-6	Latching signal to bio-vent blower V-300 permitting the energization of this blower via hand switch HS-300.

Upon de-energization of V-200 (via- a hand switch signal, loss of one or more permissive interlock signals, or the indication of excessive discharge temperature and low flow, via TSH-200 and FSL-200 respectively), the signal is created to de-energize the equipment through its associated interlock.

INTERLOCK NUMBER	LOGIC
I-6	Bio-vent blower V-300 de-energization.

The vacuum blower is protected from low flow conditions and under-pressurization via low flow switch FSL-200 and pressure safety valve PSV-200, which are located downstream and upstream, respectively, of the blower. The blower and GAC vessels are further protected from overheating conditions by high temperature switch TSH-200 located at the blower discharger. This switch acts as a secondary fail-safe mechanism to de-energize the vacuum blower should the air-air heat exchanger fail, or if downstream valves inadvertently are throttled excessively or closed, thus dead heading the fan.

Prior to the entrance of the vapor stream to the blower, the stream passes through an air-water separator which separates any liquids entrained in the stream. These liquids then are conveyed for treatment to the oil-water separator T-100 by transfer pump P-200. P-200 is energized and de-

energized upon indication of high and low liquid levels via high level switch as LSH-200 and LSL-200, respectively. De-energization of P-200 does not initiate any interlock de-latching signals. The transfer pump energization is dependent upon the energization and acquisition of the permissive Interlock signals.

INTERLOCK NUMBER	LOGIC
I-2	Hand switch HS-100 for transfer pump P-100 must be in its "auto" position.
I-7	Hand switch HS-101 for transfer pump P-101 must be in its "auto" position.
I-9	Hand switch HS-102 for transfer pump P-102 must be in its "auto" position.

The vapor flow rate, temperature, and pressure entering the air-water separator via the main header is measured by flow elements FE-209 and FE-210, temperature indicator TI-209, and pressure gauges PI-209 and 210. Temperature indicators, and pressure gauges TI-201 to TI-208, and PI-201 to PI-208, respectively, located within each extraction wellhead, are available to measure and balance the flow of vapor extracted from each recovery SVE well (RW-1 to RW-8). Total system extraction flow is manually controlled by throttling hand valve HV-209, and, if necessary, purge hand valve HV-217. Opening of hand valve HV-217 permits the inflow of ambient air into the system (via filter and silencer F-200), thus reducing both withdrawal flow volume and applied header pressure. Flow from the wells may be individually controlled through manual manipulation of their associated hand valves HV-201 to HV-208. Sample ports AP-201 to AP-208 are provided at the wellheads so vapor samples may be obtained at any time. Drawing X-002 depicts the associated extraction lines and headers, wells corresponding to each header, and all valves, sample points, flow elements, temperature indicators, and pressure gauges associated with each well and header.

The blower (V-200) discharge is directed to the heat exchanger which removes excessive heat from the air stream prior to its entrance to the GAC vessels. The heat exchanger fan is thermostatically controlled via temperature switch TSHL-200, which modulates fan energization solely upon the need to extract heat.

The energization of the heat exchanger fan requires no permissive interlock signals in order to be energized. However, when hand switch HS-201 is placed in its "auto" position, fan energization only occurs upon the indication of a high airstream temperature as detected by TSHL-200. Interlock I-5 provides a latching signal to the vacuum blower, permitting the energization of the blower via hand switch HS-200.

Upon de-energization of the heat exchanger fan (via hand switch signal), a signal is created to de-energize the equipment through an associated interlock.

INTERLOCK NUMBER	LOGIC
I-4	Vacuum blower V-200 de-energization.

The heat exchanger effluent is directed through a series of GAC vessels as the final treatment process. Each GAC vessel is equipped with camlock entry/discharge nozzles to expedite removal and installation.

Analysis ports AP-202 and AP-203 were installed between the vessels, and at the exit of the vessels, respectively, so that air analysis samples can be taken. Finally, prior to discharge to atmosphere, flow element FE-210 and temperature gauge TI-210 were installed in effluent piping to measure exiting air flow and temperature.

3.4 Compressed Air System

3.4.1 System Description

The compressed air system provides high pressure, service-quality motive air for operation of the total fluid recovery pumps. The system consists of a two-cylinder, dual-stage, oil-lubricated air compressor, a 60-gallon receiver tank, a pressure regulator, and an inlet air filter with a silencer. The air compressor is driven by a 1.5-hp motor and supplies air up to 100 psig at 6.5 scfm. Pressure regulator PCV-400 maintains air header pressure at 40 psig.

3.4.2 Major Equipment

3.4.2.1 Air Compressor. The Ingersoll-Rand type 30234 N1.5 two-stage reciprocating air compressor (K-400) is rated to provide a minimum of 6.5 cubic feet per meter (cfm) of air at 100 psig. The unit, which provides motive air to the total fluid recovery pumps, contains the features described below.

- A 460 volt, 3-phase NEMA Standard TEFC electric motor provides 1.5 hp to operate the compressor. On and off control of the motor is provided by an Ingersoll-Rand magnetic motor starter with a fusible disconnect (UL Class RK5-600 volt fuse clips) which is contained in a NEMA 4 enclosure.

- A multi-finned air-cooled aftercooler reduces the temperature of the compressed air discharge to facilitate removal of water and oil vapor. The condensed moisture passes on to the receiver where it is drained by an automatic drain trap.

- The 60-gallon receiver tank (T-400) is ASME rated to contain 200 psig of compressed air. Pressure relief valve PSV-400, mounted on the air receiver, opens at 200 psig to protect the receiver from over-pressurization. Relieved air is discharged to the atmosphere.

- Pressure control valve PCV-400 maintains the output pressure of the main service air header at approximately 40 psig. The regulator is externally adjustable over a pressure range from zero to 120 psig. Pressure gauge PI-400, located downstream of the regulator provides visual indication of header air pressure. Check valve XV-400 prevents air from flowing back into the compressor from the air receiver during compressor standby or shutdown conditions.

- The receiver is equipped with an automatic drain trap which is used to expel the condensate from the receiver. Drainage from the trap is collected manually and is emptied into the oil-water separator for treatment.

- An Ingersoll-Rand low oil level switch shuts down the unit if the oil level in the compressor frame reaches an unsafe level. The switch is a single-pole, double-throw device and is NEMA 4 rated. An oil indicator glass on the crankcase housing provides visual indication of the oil level.

- The compressed air system includes a 4-micron filter and silencer on the ambient air inlet (F-400, S-400) to protect the compressor from processing a high particulate airstream. Air coalescing filter F-401 is provided at the outlet to remove solids, moisture, lubricants, and oil aerosols from the compressed air stream to protect the total fluid recovery pumps.

- A low pressure switch with dry contact (PSL-400) regulates operation of the air compressor, in conjunction with the PLC, by maintaining adequate pressure within the receiver tank.

3.4.3 Functional Description

The air compressor is energized by hand switch HS-400, which may either be placed in the "off", "auto", or "hand" positions. In the "auto" position, interlock I-8 will accept a signal from the air receiver pressure switch PSHL-400, which, if the receiver air pressure is below the desired set point, initiates a compressor run sequence. If the receiver pressure is above the desired pressure, the compressor remains on standby, awaiting an energization signal. Should the pressure in the air receiver fall below a minimum desired pressure, an alarm signal is created via the energization of pressure switch PSL-400.

Intake air is compressed in the first-stage cylinder after which it is manifolded to the second-stage cylinder for final compression. After compression, the air is stored in air receiver T-400. When pressure switch PSHL-400 reaches 175 psig, the switch opens and the motor is de-energized.

As the air in the receiver is drawn off, pressure in the receiver drops until pressure switch PSHL-400 reaches 150 psig. The switch then energizes the compressor motor to re-initiate a run sequence. The switch will allow the operator to choose motor on or off mode of operation or motor load or unload mode of operation. The compressor motor should not cycle on and off more than four times per hour. For higher air demand, the switch is operated in the load or unload mode; however, the compressor motor should not run unloaded more than three minutes.

The main solenoid valve FC-400 (which is energized when open, closed when failed) controls the supply of influent groundwater into the treatment compound as delivered by eight in-well pneumatically operated pumps WP-101 through WP-108. This is accomplished by controlling compressed air flow to the in-well pumps, thus preventing untreated water from entering the treatment complex unless the water treatment system is fully operational. Individual pressure and motive compressed air volume to each well pump may be monitored and controlled via pressure indicators and air throttling valves that are located at each well. Valve FC-400 is controlled by the permissive interlocks through interlock I-1 for energization.

INTERLOCK NUMBER	LOGIC
I-2	Hand switch HS-100 for transfer pump P-100 must be in the "auto" position.
I-8	Hand switch HS-400 for air compressor K-400 must be in the "auto" position.
I-9	Hand switch HS-102 for transfer pump P-102 must be in the "auto" position.

Upon the de-energization of solenoid valve FC-400 (via hand switch signal, or the loss of one or more of the permissive interlocks listed above), a signal is created to de-energize the equipment through an associated interlock, as described briefly below.

INTERLOCK NUMBER	LOGIC
I-4	Vacuum blower V-200 de-energization.

The de-energization of solenoid valve FC-400 and the equipment listed above effectively stops the delivery of and processing of fluid within the treatment complex.

3.5 Electrical System

3.5.1 System Description

The electrical system provides the necessary power to operate and monitor the various pieces of process equipment and instrumentation. The major equipment (i.e., pumps, blowers, fans) requires 480-volt, 3-phase, 60-hertz power. Step-down transformer PP-GWT2 provides power for low voltage equipment.

3.5.2 Major Equipment

3.5.2.1 Electrical. To provide the electrical power requirements for the remediation equipment, 480- volt, 3-phase, 100-amp power was brought into the treatment area. This was achieved by routing power cabling from the 480 volt DFSP electrical system at building 208 to power pole 70 near the treatment compound. For low voltage loads, power is stepped down to 120/240 volts at panel PP-GWT2. Refer to drawing E-001 for the electrical one-line diagram for PP-GWT1 and PP-GWT2.

3.5.2.2 Power Cell. An American Power Conversion PowerCell^{R} was installed to provide uninterrupted power to the PLC unit. The auxiliary system is necessary as the transformers in building 208 step the power down to a level equal to the maximum voltage the PLC can tolerate. The PowerCell^{R} suppresses power surges to levels well below that which is compatible with the PLC.

3.6 PLC System

3.6.1 System Description

Equipment operation, alarm capability, and system integration are controlled by a PLC that monitors the input/output (I/O) states of various control devices and motor starters. Based on the system program, the PLC directs the operation of equipment through various interlocks to preclude off-site releases of contaminated liquids or vapors. Input signals are monitored by the PLC with outputs to start or stop equipment or alert the operator when process parameters are exceeded.

The PLC is a modular I/O controller that uses an Allen-Bradley SLC 5/03 microprocessor. It is rated for operation in Class I, Division 2 hazardous environments.

3.6.2 Major Equipment

3.6.2.1 Main Control Panel. The main control panel consists of the Allen-Bradley SLC 5/03 PLC microprocessor, a federal alarm horn, and associated control wiring. The panel is enclosed in a NEMA 4 enclosure.

3.6.2.2 PLC. The main control panel contains the PLC to control system operation. The PLC receives operating power from panel PP-GWT2. Control signals are transmitted from parameter monitoring instrumentation to activate commands to start, stop, and emergency shutdown process equipment based on pre-programmed logic instructions received from locally mounted measuring devices. An Allen-Bradley SLC 5/03 processor with modular inputs was installed to control system operation. If an abnormal condition develops requiring operator action, an auto-dialer automatically calls a maintenance telephone number to alert the operators.

3.6.2.3 Interlocks. Various interlocking functions are programmed into the PLC (as summarized in table 3-1 to control process operation with safety as the primary objective. The ladder logic ensures that equipment failures preclude further withdrawal of contaminated liquids and vapors to prevent an untreated release from occurring. Hand switches are provided to control equipment operation and can be placed in "off", "auto", "jog", or "hand" positions. The "jog" position allows the rotation of equipment through a momentary contact switching mechanism. All interlocks are bypassed in this position. When the hand switch is in the "off" position, the associated equipment motor is prohibited from energizing due to a remote start signal. "auto" allows the equipment to operate according to the interlock logic associated with the system. "Hand" bypasses interlock permissives as determined by the PLC. This allows testing individual equipment without having to satisfy the interlocks.

3.6.2.4 Instrumentation. In addition to interlocks, instrumentation is provided for monitoring process parameters such as temperature, pressure, and flow. Table 3-2 contains a description of each element utilized in the system. The information from the instruments is used to monitor overall system operation, determine if operator action is necessary to equalize process flows, enhance system performance, or correct a developing abnormal condition. An auto-dialer is provided to alert the operator of the need for immediate corrective action.

3.6.2.5 Control Devices. Control devices provide input to the interlocks to control system operation. These include level, temperature, pressure, and differential pressure switches. The switches will be calibrated to actuate at a pre-determined setpoint that signals equipment operation (start or stop). Table 3-3 lists the control devices and the applicable set points. Alarms are provided to alert the operator of the need for immediate corrective action.

4.0 OPERATIONAL AND CONTROL PROCEDURES

This section details the specific steps to take to check and operate individual components of the system. Refer to process and instrumentation diagrams (PI&Ds) for the systems, drawings X-100 and X-101. Additional detailed information for each component is available in the manufacturer O&M manuals in appendices C and D. Each item of equipment noted herein is further detailed by the manufacturer in this appendix. These written instructions should be consulted prior to beginning any site operations.

System energization and startup should follow in the order which the components to the system are presented in this section. Deviations from following this order, skipping, revising, or deleting individual steps within any section startup procedure without prior approval by the project engineer may cause an unsafe condition, delays in overall completion, or unforseen operational problems.

NOTE: System start-up and testing must be performed by fully trained and qualified individuals with experience with PLCs. Unqualified individuals must not execute start-up steps unless under the guidance of a project engineer.

4.1 Prerequisite Conditions

Prior to full system start-up and operation, the following prerequisite items must be observed and verified:

- All safety rules and regulations are enforced.
- All instruments have been calibrated and properly installed.
- PLC diagnostics have been run, and the PLC is verified in full operational mode.
- Personnel performing the start-up have received appropriate operations training.
- Adequate manpower is available to assist in the entire system monitoring during the start-up phase.
- All equipment, valves, and instruments are tagged.

4.2 Pre-Start-up Inspection

System start-up involves a pre-start-up inspection of the entire system and testing of major treatment equipment and instruments. This ensures that pre-existing problems are identified up front to prevent additional malfunctions to other equipment from occurring. Furthermore, because of the interdependencies among the various processes, proper valve positioning and control device settings (tables 3-1 and 4-1) are imperative for equipment and operator safety.

Prior to initial start-up, all equipment, including electrical components, instruments, and control panels, must be inspected. Procedures pertaining to equipment and instrument inspection, calibration, and general maintenance are addressed in section 5.0. Equipment-specific details are provided in the vendor's O&M instructions found in appendices C and D.

Equipment testing prior to placing it in full service entails verification of system integrity, proper rotation, and control device relay operation. Any unsatisfactory results must be evaluated to determine the impact on the entire system. If necessary, any defective components must be repaired or replaced before commencing air injection and contaminant extraction. Prerequisite conditions and procedures for start-up testing related to system commissioning are provided in the pre-startup checklists.

The treatment compound must be integrated into injection and extraction and treatment systems that are functionally and logically connected. The bio-venting system may not operate unless the vapor extraction and treatment system is functional. The compressed air system may not operate unless the groundwater and product recovery system is functional.

4.2.1 Groundwater and Product Recovery System

For the groundwater and product recovery system, verify that the following start-up conditions have been met::

- Total fluid recovery pumps WP-101, WP-102, WP-103, WP-104, WP-105, WP-106, WP-107, and WP-108 have been properly installed in each recovery well.
- Flow elements FE/FQI-100 and FE/FQI 101 have been properly installed and calibrated.
- Transfer pumps P-100, P-101, and P-102 have been properly installed and have been jogged to verify proper rotation.
- Oil-water separator T-100, free product storage Tank T-101, filters F-101A/B, liquid- phase GAC vessels T-102 and T-103, and treated water storage tank T-104 have been properly installed, all inlet/outlet ports connected properly, all vents opened, drains closed, and any spare openings plugged.
- The following instruments have been verified as being calibrated, installed, and are fully functional:
  - FSL-100, FSL-101, and FSL-102
  - PSV-100 and PSV-102
  - LI-100
  - PI-100, PI-101, PI-102
  - LSHH-102
  - LSL/LSH/LSHH-100 and 101
  - PDI/PSH/PSHH-100
  - LSH/LSHH-103
- Interlocks I-2, I-7, and I-9 have been properly programmed, and all associated hand switches (HS-100, HS-101, and HS-102), wiring, instrument connections, and alarms have been installed.
- All piping and valves have been installed, and all valves have been aligned per the P&ID. Instrument root valves have been fully opened.
- Hydro/leak testing of the piping and appropriate components has been successfully completed and appropriate documentation has been approved.
- All hangers and supports have been installed.
- All equipment anchor bolts and straps have been installed and proper hold down bolt torques applied.

- Desiccant, temporary packing, plugs, and shipping softeners and braces surrounding vendor-supplied instruments have been removed from oil-water separator T-100, filters F-101A/B, and liquid-phase GAC vessels T-102 and T-103.

- Any remaining vendor-specific directed action has been completed on the equipment as identified in the vendor-supplied O&M manuals located in appendix C.

4.2.2 Vapor Extraction and Treatment System

For the vapor extraction and treatment system, verify that the following start-up conditions have been met:

- Air heat exchanger X-200 and air-water separator T-200 have been properly installed, all inlet/outlet ports connected properly, all vents opened, drains closed, and any spare openings plugged.

- Flow elements FE-209 through FE-211 are properly installed and calibrated.

- Vacuum blower V-200 has been properly installed and has been jogged to verify proper rotation.

- Filter F-200 has been properly installed and HV-217 is fully opened.

- The following instruments have been verified as calibrated, installed, and are fully functional:
  - FSL-200 and TSH-200
  - TI-201 through TI-211
  - PI-201 through PI-209
  - TSHL-200
  - LSL/LSH/LSHH-200

- Vacuum relief valve PSV-200 has been calibrated, installed, and is fully functional.

- Interlocks I-3, I-4, and I-5 have been properly programmed, and all associated hand switches (HS-202, HS-200, and HS-201), wiring, instrument connections, and alarms have been installed.

- Pneumatic pressure leak testing of the piping and appropriate components has been successfully completed and appropriate documentation has been approved.

- All hangers and supports are installed.

- All equipment anchor bolts and straps have been installed and proper hold down bolt torques applied.

- Desiccant, temporary packing, plugs, and shipping softeners and braces surrounding vendor-supplied instruments have been removed from heat exchanger X-200, air-water separator T-200, filter F-200, transfer pump P-200, and vapor extraction blower V-200.

- Any remaining vendor-specific directed action has been completed on the equipment as identified in the vendor-supplied O&M manuals located in appendix C.

4.2.3 Bio-Venting System

For the bio-venting system, verify that the following start-up conditions have been met:

- Bio-venting blower assembly, comprised of the blower V-300, pressure relief valve PSV-300, silencer S-300, inlet filter F-300, and blowoff silencer S-301, has been properly installed, all inlet/outlet ports connected properly, drains closed, and any spare openings plugged.
- All piping and valves have been properly installed.
- The following instruments have been verified as calibrated, installed, and are fully functional:
  - PI-301 through PI-320
  - TI-301 through TI-319
  - FE-301 through FE-319
- Instrument root valves have been confirmed fully opened.
- Hydro-testing of all piping and appropriate components to ASME B31.1, Power Piping Code requirements has been successfully completed.
- All hangers and supports, expansion joints, sway struts, and rigid restraints have been installed.
- Pressure relief valve PSV-300 has been properly calibrated and set to its desired relief pressure. All spring retaining straps have been removed, and the valve has been installed properly.
- Pneumatic pressure leak testing of the piping and appropriate components has been successfully completed and appropriate documentation has been approved.
- Desiccant, temporary packing, plugs, and shipping softeners and braces surrounding vendor-supplied instruments have been removed.
- Valves HV-301 through HV-319 have been fully closed and HV-320 is fully open.
- Any remaining vendor-specific directed action has been completed on the equipment as identified in the vendor-supplied O&M manuals located in appendix C.
- Appropriate personnel warning signs have been installed.

4.2.4 Compressed Air System

For the compressed air system, verify that the following start-up conditions have been met:

- Air compressor assembly comprised of the compressor K-400, check valve XV-401, air receiver T-400, pressure relief valve PSV-400, silencer S-400, inlet filter F-400, condensate trap XV-400, and air coalescing filter F-401, has been properly installed, all inlet/outlet ports connected properly, drains closed, and any spare openings plugged.
- Filter F-401 has been properly installed and the drain valve closed.
- Pressure regulating valve PCV-400 has been properly calibrated, set to the desired pressure, and installed properly.
- Flow Control solenoid valve FC-400 has been properly installed.
- Interlocks I-1 and I-8 have been properly installed, and all associated hand switches (HS-401 and HS-400), wiring, instrument connections, and alarms have been installed.
- All piping and valves have been installed and all valves have been aligned per the P&ID. Instrument root valves are fully open.
- Air compressor K-400 has been jogged to assure proper rotation.
- Hydro/pneumatic pressure leak testing of the piping and appropriate components has been successfully completed and appropriate documentation has been approved.
- All hangers and supports have been installed.
- All equipment anchor bolts and vibration control devices are installed and proper hold down bolt torques applied.
- Desiccant, temporary packing, plugs, and shipping softeners/braces surrounding vendor supplied instruments are verified removed from the air compressor assembly skid, pressure control valve PCV-400, and solenoid valve FC-400.
- The following instruments are verified as calibrated, installed and fully functional:
  - PSL/PSHL-400
  - PI-400
- Wellhead Isolation Valves HV-401 through HV-408 and main isolation valve HV-409 are closed.
- Any remaining vendor specific directed action is completed on the equipment as identified in the vendor supplied O&M manuals located in Appendix C.

4.3 Start-Up Procedures

Start-up procedures are as follows:

- Ensure that the pre-start-up inspection has been completed.

- Move the following hand switches to their "auto" position:
  - HS-100 (transfer pump P-100)
  - HS-101 (transfer pump P-101)
  - HS-102 (transfer pump P-102)

NOTE: In this position, with fluids absent from the system, **no** equipment should energize. If any equipment energizes, return the respective hand switch to "off", and investigate and resolve the power or control cable error prior to proceeding further.

- Connect a temporary hose to an on-site potable water source, and route the hose to the outlet of liquid-phase GAC vessel T-102. Open AP-111 and fill T-102; then move the hose to the outlet of liquid-phase GAC vessel T-103. Open AP-111 and fill T-103; then disconnect the hose and reconfigure the GAC piping to the original position.

- Connect the temporary hose to the oil-water separator (T-100) manway. Begin filling the oil-water separator plate pack chamber. **Do not** fill the oil reservoir chamber.

- The water level in the oil-water separator should rise to allow water to flow from the plate pack chamber to the surge tank chamber. Continue filling T-100 until pump P-100 energizes (at the LSH-100 set point). At the time of pump energization, cease filling the oil-water separator. Pump P-100 should withdraw fluid from the surge tank chamber of T-100 sufficiently to drop the liquid level below the LSL-100 set point. At this point, P-100 should de-energize. Fluid from P-100 may be of a sufficient volume to flood particulate filters F-100A/B and begin filling treated water storage tank T-104.

- Refill the oil-water separator until P-100 energizes. While P-100 is operating, manually operate the oil-water separator level switch LSHH-100. Verify the presence of an alarm signal.

- Refill the T-100 until pump P-100 energizes. While P-100 is operating, manually operate tank T-104 level switch LSHH-101. Verify the automatic de-energization of pump P-100.

- Remove the cover from pressure switch PSH-100. While P-100 is operating, manually operate the contacts on pressure switch PSH-100. Verify the presence of an alarm signal. Replace the cover.

- Remove the cover from pressure switch PSHH-100. While P-100 is operating, manually operate the contacts on pressure switch PSHH-100. Verify the presence of an alarm signal and the automatic de-energization of pump P-100. Replace the cover.

- Observe the differential pressure across particulate filters F-101A/B via PDI-100. Record this data.

- Slowly close HV-111. Verify the de-energization of pump P-100 and the presence of an alarm signal. Open HV-111.

- Position hand switches HS-100 (pump P-100), HS-101 (pump P-101), and HS-102 (pump P-102) to their "off" positions.

- Verify that the plate pack chamber in T-100 is full, and remove the potable water fill hose from the T-100 manway. Replace the manhole cover and tighten the hold-down bolts.

- Return hand switches HS-100 (pump P-100), HS-101 (pump P-101), and HS-102 (pump P-102) to their "auto" positions.

- Position hand switch HS-400 to the "auto" position. Compressor K-400 should start. Observe the pressure in gauge PI-400 until the compressor de-energizes. Adjust PCV-400 until the pressure at gauge PI-400 reads 50 psig. Open the drain valves on receiver T-400 (HV-414) and F-401 for 10 seconds each to exhaust any water or particles.

- Position hand switch HS-401 to the "auto" position.

  NOTE: At this point in the start-up, all permissive interlocks to compressed air flow control solenoid valve FC-400 are made. Compressed air will now be delivered to the eight total

  fluid recovery pump wellheads RW-1 through RW-8. **If any of the isolation valves HV-401 through HV-408 are open, contaminated groundwater and free product will now begin to be extracted from the ground.**

- At wellhead RW-1, open HV-101 and HV-401. Verify that pump WP-1 cycles and no fluid leaks occur in wellhead piping. Repeat the process at each total fluid wellhead until all recovery wells are automatically cycling and no fluid leaks are identified.

- As free product collects in the oil-water separator, transfer pump P-102 will energize as the contacts to level switch LSH-103 are made. Observe the operation of the pump and record the cycle time during which the pump remains energized. Pump P-102 should de-energize when the product chamber of T-100 is empty and a low flow condition is detected by FSL-102.

- During pump P-102 operation, manually operate free product storage tank (T-101) high level switch LSHH-102. The following should occur:

  - Pump P-102 should immediately de-energize and an alarm should sound.
  - Flow Control Valve FC-400 should immediately close.
  - Flow, as measured at FE-100 (1-inch-FP-111-PVC-I) should halt within 10 seconds.

- Position hand switch HS-201 (heat exchanger fan X-200) in the "auto" position. X-200 should energize only if the temperature at TSHL-200 is greater than 120°F. If X-200 energizes, return hand switch HS-201 to the "off" position and investigate and resolve the power or control cable error prior to proceeding further.

Position hand switch HS-202 (transfer pump P-200) in the "auto" position. Pump P-200 should not energize, but should be in a "ready" mode awaiting fluid from air-water separator T-200. If P-200 energizes, return hand switch HS-202 to the "off" position and investigate and resolve the power or control cable error prior to proceeding further.

- Verify that HV-201 through HV-208 and HV-217 are fully open and HV-209 is fully closed. Place hand switch HS-200 (vapor extraction blower V-200) in the "auto" position. Blower V-200 should energize.

- Slowly open the main header throttling valve HV-209 while closing the dilution valve HV-217. Monitor the vapor concentration at AP-209 and continue to manipulate these valves until the flow rate and vacuum in the main header, as detected by FE-209, FE-210, PI-209, and PI-210 are at the required conditions.

- Adjust each extraction well isolation valve (HV-201 through HV-208) while monitoring pressure indicators PI-201 through LPI-208 to attain the desired vacuum balance across the wells. Valves HV-209 and HV-217 may require adjustment to permit a greater header vacuum, should throttling of individual extraction points limit total desired flow.

- Remove the cover from high-level switch LSHH-200. While blower V-200 is operating, manually operate the contacts on level switch LSHH-200. The vapor extraction blower should immediately de-energize and an alarm signal sound. Replace the cover.

- Position hand switch HS-201 (extraction heat exchanger fan X-200) to the "off" position. V-200 should immediately de-energize and an alarm should sound. Reposition HS-201 to the "auto" position; V-200 should restart and the alarm should become silent.

- Manually operate high temperature switch TSH-200. V-200 should immediately de-energize and an alarm should sound. Reset TSH-200; V-200 should restart and the alarm should become silent.

- During operation, condensate should collect in the air-water separator. Verify the operation of level controls in T-200 by operating high level switch LSH-200. P-200 should energize. Pump P-200 should de-energize when the water level in T-200 goes below LSL-200.

- Verify that HV-301 through HV-316 and HV-320 are fully open and HV-317 through HV-319 are fully closed. Place hand switch HS-300 (bio-venting blower V-300) in the "auto" position. Blower V-300 should energize.

NOTE: Vacuum blower V-200 must be operating for bio-venting blower V-300 to operate.

- Remove the cover from low flow switch FSL-300. While V-300 is operating, manually operate the contacts on flow switch FSL-300. The vapor extraction blower should immediately de-energize and an alarm signal sound. Replace the cover.

- Remove the cover from high temperature switch TSH-300. While V-300 is operating, manually operate the contacts on temperature switch TSH-300. The vapor extraction blower should immediately de-energize and an alarm signal sound. Replace the cover.

- Slowly open main header throttling valves HV-317, HV-318, and HV-319 while closing dilution valve HV-320. Continue to manipulate these valves until the flow rate and pressures in the main header, as detected by FE-317, 318, 319 and PI-317, 318, 319, are at the required conditions.

- Adjust each bio-venting well isolation valve (HV-301 through HV-316) while monitoring flow elements FE-301 through FE-316 to attain the desired flow balance across the wells. Valves HV-317 through HV-320 may require adjustment to permit a lower header pressure, should throttling of individual injection points limit total desired flow.

- At no time should any header pressure rise above 15 psig. If a rise in pressure to greater than 15 psig occurs, throttle back on the appropriate valve (HV-317, HV-318, or HV-319) five full turns. Once readjusted, reopen the appropriate valve slowly.

- Balance the flow to each injection well to the desired flow rate by manipulating the injection point throttling valves HV-331 through HV-346 while monitoring flow elements FE-301through FE-316.

- Record the injection point temperatures at each injection well via TI-301 through TI-316. Record the injection point pressures at each injection well via PI-301 through PI-316.

At this point, the integrated system-startup is complete and the system may be considered to be in full operational mode. Should the system be fully or partially de-energized, restart should proceed according to the steps outlined, after the prerequisites are re-verified. The responsible project engineer may elect to skip over start-up steps where interlocks and instrument controls are verified operable only in the event that system shutdown was not initiated by equipment malfunction or failure. In this case, reverification of interlock operation, equipment rotation, and instrument function must be made according to the applicable steps in this procedure.

4.4 System Operation

During the operation of the system, the operator must perform the following tasks on a regular basis:

- Monitor the pressure and temperature at the air injection headers at PI-17 through PI-20 and TI-17 through TI-20.

- Monitor flow in the air injection system headers at FE-317 to FE-319.

- Control the supply of air to the system by adjusting HV-317 through HV-319, as required.

- Monitor the pressure and temperature for each of the air injection wells at PI-301 through PI-316 and TI-301 through TI-316, respectively.

- Monitor the air flow into the bio-vent wells for each interval at FE-301 through FE-316.

- Control air injection into the subsurface by adjusting valves HV-331 through HV-346.
- Monitor the compressed air supply pressure to the groundwater extraction wells at PI-400.
- Check the air compressor oil level.
- Monitor the vacuum and flow of the vapor extraction wells at PI-201 through PI-208.
- Monitor the temperature of the effluent of the vacuum blower at TI-211.
- Monitor the level of condensate in the air-water separator by inspecting the sight glass mounted on the exterior of the air-water separator.
- Monitor the total product pumped to the free product storage tank at FQI-100.
- Monitor the liquid level in the product reservoir at LI-104.
- Monitor the differential pressure across the duplex filters at PDI-100.
- Monitor the influent and effluent pressure at the particulate filters at PI-100 and PI-102, respectively.
- Monitor liquid treatment system effluent pressure and flow at PI-101 and FE/FQI-101, respectively.
- Inspect all piping and components for leaks.
- Clean or replace filters for the compressed air system on particulate filters F-400 and F-401, as needed.
- Clean or replace filters for the bio-vent blower, F-300 and F-301, as needed.
- Clean or replace filter for the vacuum blower, F-200, as needed.
- Replace particulate filters F-100A/B in the duplex filters as needed.

4.5 System Shut Down

The entire system can be shut down manually or automatically. Manual shut down occurs by turning the control panel power switch and the various motor starters to the "off" position. Automatic shutdown occurs when a control device actuates to shut down an individual process or the entire system. If necessary, during emergencies, the entire system can be manually shut down to prevent exacerbating the situation.

Systematic shut down and alarm will occur under the following conditions:

- High level in product storage tank T-101 indicated by LSHH-102
- Failure of the air compressor or loss of service air pressure (per PSL-400)

- Failure of pump P-100 or indication of high pressure per PSHH-100
- High level in the oil-water separator (as indicated by LSHH-100 or LSHH-103)
- High level in treated water storage tank T-104 as indicated by LSHH-101
- Failure of condensate transfer pump P-200 or high liquid level in the air-water separator as indicated by LSHH-200
- High temperature of TSH 200 at outlet of blower
- Failure of pump P-101, P-102, blower V-200 or V-300 or air compressor K-400

5.0 MAINTENANCE

5.1 Maintenance

Maintenance of system components is imperative to ensure unsafe conditions do not develop and prevent inadvertent and costly failures during system operation. For the purpose of this manual, maintenance is divided into three types: routine, preventive, and corrective. Routine maintenance generally involves frequent monitoring and visual inspection of the equipment, and includes an awareness of items such as odors in the air, sudden changes in the sound of the operating equipment, visible breaks in piping, leaks detected by abnormal moisture accumulation or discoloration, or excessive vibrations of the equipment or the foundations. Preventive maintenance is performed on a scheduled basis, as specified by the vendor, to preserve and prolong the life of the system components. Typical preventative maintenance procedures include cleaning, lubrication, and inspection of the parts and components inside the equipment. Corrective maintenance primarily involves equipment repair following a failure.

Some system components may require maintenance more frequently than others. A schedule for preventive maintenance of the major process equipment and instruments is contained in table 5-1. The time intervals for required maintenance specified in the preventative maintenance matrix are approximate, and actual operating hours should be taken into consideration when determining the intervals between required maintenance. In addition, continuously starting and stopping equipment will decrease the amount of operational hours the unit is capable of before maintenance is required.

It is imperative that all personnel performing preventive or corrective maintenance on any part of the system are familiar with the Site Health and Safety Plan and have a complete understanding of this manual's section 10.0 - regarding safety . Section 10.3 must be referenced prior to performing any maintenance on this system. In addition, the operator shall refer to the manufacturer's O&M manual found in appendices C and D for equipment-specific safety protocol.

5.1.1 Bio-Vent System

5.1.1.1 Piping. Routine and corrective maintenance measures are described below.

- **Routine Inspection.** Inspection of the air injection piping is necessary to monitor the integrity of the piping systems. Any degradation in the integrity of the piping or its components should be determined by monitoring the pressure in the pipes and by visual inspections for leaks.

  Before performing any maintenance on this equipment, refer to the lockout/tagout procedures described in section 10.3.

- **Corrective Measures**. As a corrective measure, defects and leaks must be repaired as soon as they are detected. The systems must be shut down before attempting the repairs, and all repairs must follow standard industrial practices and procedures recommended by the manufacturers.

  Any repaired or newly installed piping must be statically tested in accordance with the hydrostatic and pneumatic test procedures found in appendix G to ensure system integrity has not been compromised.

5.1.1.2 Valves. Routine, preventive, and corrective maintenance measures are described below.

- **Routine Inspection.** Routine inspection of all valves must include visual inspection for leakage on a weekly basis. During the inspection, the operator must visually check each valve for any cracks, leaks, and drips around the valve body and the connection with the piping.

  Before performing any maintenance on this equipment, refer to the lockout/tagout procedures described in section 10.3.

- **Preventive Maintenance.** An annual function check must be performed during which the valve interiors are inspected. The valve internal parts must be checked for wear, presence of solids, and corrosion damage. Before attempting to open any valve unit , the operator may have to shut down the system if in-line inspection of the particular valve is not possible. In addition, the valve and associated piping may need to be completely drained or vented before the valve is opened for inspection. Typical ball valve areas requiring inspection must include the ball, seat and seal, valve stem, and packing. Typical globe valve areas requiring inspection must include the disc, valve stem, and packing gland. Typical check valve areas requiring inspection must include the disc, spring, and disc seat. Typical solenoid valve areas requiring inspection must include the valve control accessory settings and the valve body in general.

- **Corrective Measures.** Detection of any problems must immediately prompt the removal of the faulty unit from service and replacement of the failed components. Any components requiring replacement must be ordered from the spare parts list provided in the appropriate manufacturer's O&M manuals found in appendix C. Replacement of a valve may require shutdown of the treatment system if a bypass line does not exist or cannot be used at the time of the repair. When system shutdown is necessary, the piping in which the valve unit is installed must be completely drained before the valve is physically opened or removed for repair.

5.1.1.3 Wellheads. Routine and corrective maintenance measures are described below.

- **Routine Inspection.** Visual inspection of the wellhead must be performed and documented weekly to ensure that the structure is intact and does not provide a potential conduit for contaminants to migrate from the ground surface into the aquifer. Inspections must consist of visual examinations of the wellhead area including the valves, gauges, hoses, piping, and sample ports. The area around the wellhead must be kept free of foreign objects such as debris and liquid from surface runoff.

  Before performing any maintenance on this equipment, refer to the lockout/tagout procedures described in section 10.3.

- **Corrective Measures.** Leaking valves, gauges, or sample ports must be repaired (or replaced if necessary) immediately upon detection. Any components requiring replacement must be ordered from the spare parts list provided in the appropriate manufacturer's O&M manuals found in appendix C. If the wellhead itself is cracked or has suffered other structural damage, it must be reported immediately to the project engineer and repaired or replaced per his or her instruction.

5.1.1.4 Gauges. Routine, preventive, and corrective maintenance measures are described below.

- **Routine Inspection**. Because every pressure and temperature gauge and flow meter installed in the system will be monitored weekly, it will be possible to make a weekly inspection of these units. The inspection must include checking for cracks, leaks, loss of internal fluid, and drips around the meter. The piping connection also should be checked for any other sign that the gauge or meter is malfunctioning or requires recalibration.

  Before performing any maintenance on this equipment, refer to the lockout/tagout procedures described in section 10.3.

- **Preventive Maintenance**. All gauges must be inspected annually for proper function and correct calibration. The internal parts of each device must be checked for wear, presence of solids, and corrosion damage. Calibration procedures for each instrument are outlined in the vendor O&M manuals located in appendix C.

- **Corrective Measures**. Detection of any problems must immediately prompt the removal of the faulty unit from service and replacement of the failed components. Any components requiring replacement must be ordered from the spare parts list provided in the appropriate manufacturer's O&M manuals found in appendix C. Replacement of a meter may require shutdown of the treatment system if a bypass line does not exist or cannot be used at the time of the repair. When system shutdown is necessary, the piping in which the unit is installed must be completely drained before the instrument is physically opened or removed for repair. All monitoring instruments must be repaired and recalibrated, as needed, in accordance with the manufacturer's O&M information found in appendix C.

5.1.1.5 Bio-Vent Blower. Routine, preventive, and corrective maintenance measures are described below.

- **Routine Inspection**. The blower oil level must be monitored weekly and maintained at a suitable level as dictated in the manufacturers O&M manual included in appendix C. Filters F-300 and F-301 must be visually inspected weekly to prevent blower failure due to a clogged filter. The weekly inspection also must include checking the unit for hot spots and unusual noise or vibration. The oil level on the blower motor must be monitored as well and maintained at adequate level as dictated in the manufacturer's O&M manual.

  Before performing any maintenance on this equipment, refer to the lockout/tagout procedures described in section 10.3. Additional safety guidance and detailed instructions are provided in the manufacturers O&M manual found in appendix C.

- **Preventive Maintenance**. The drive end bearings must be lubricated every week per instructions in the manufacturers O&M manual in appendix C. In addition, the oil must be changed every six weeks as directed in the manual. Filters F-201 and F-200 must be changed as deemed necessary by the results of the weekly inspection.

  The exterior of the blower motor must be inspected weekly for cleanliness and must be cleaned, as required. The motor grease must be checked every three months for quality and must be maintained, as required.

In a belted drive system, the belt tension should be checked periodically and inspected for frayed or cracked belts.

- **Corrective Measure**. Seals are subject to deterioration and may require periodic replacement. Detection of spot heating must prompt an inspection of the impeller to ensure it is not rubbing against the cylinder headplate. Such a condition must be rectified as described in the manufacturers O&M manual in appendix C. Directions for replacing timing gears, shaft bearings, and impellers are also found in the manual. Causes of any other problems detected during routine inspection can be determined in accordance with the manufacturers troubleshooting guide provided on page 9 of the company's O&M manual.

5.1.2 Groundwater and Product Recovery System

5.1.2.1 Total Fluid Recovery Pumps (WP-101 through WP-108). Routine, preventive, and corrective, maintenance measures are described below.

- **Routine Inspection**. The piping, hoses, and all connections related to the pumps must be inspected weekly for corrosion, scaling, damage, and leakage. Also, all support cables and eyelets must be checked for integrity. The pump casing itself must be visually inspected for pits, holes, or other signs of corrosion. These may be signs of abnormal water chemistry. In addition, the air filter and filter bowl drain on the single stage filter/regulator must be checked for saturation and operation once a month.

  Before performing any maintenance on this equipment, refer to the lockout/tagout procedures described in section 10.3. Additional safety guidance and detailed instructions are provided in the AP-4 Operation and Maintenance Manual found in appendix C.

- **Preventive Maintenance**. The air filters on the air line to the pumps must be drained of collected particles, water, and oil monthly. During disassembly, attention should be paid to the condition of o-rings and seals. Any visible signs of unusual wear (e.g., cracks or cuts) will indicate that a replacement is needed. The air line y-strainers must also be cleaned monthly as part of the routine maintenance. The entire interior of the pumps must be cleaned while disassembled. Cleaning of the pump interior must be performed as stated in the AP-4 O&M manual (see appendix C). Likewise, o-rings must be lubricated as noted in the manual prior to re-assembly. The pump cycle counter should also be cleaned at this time. All threaded connections must be re-assembled using Teflon tape or a similar material.

- **Corrective measures**. Any noted defective or damaged parts of the pump must be replaced immediately. All piping or hoses that have excessive wear or scaling must be replaced to avoid any potential clogs or breaks. Abnormal wear to any part of the pump, internal or external, is a sign that an environmental change has occurred or that the pump is not functioning properly. This must be assessed prior to re-installation.

5.1.2.2 Oil-Water Separator (T-100). Routine, preventive, and corrective maintenance measures are described below.

- **Routine Inspection**. The unit must be inspected weekly for leaks. During a monthly inspection, the oil layer on top of the separator must be checked to ensure that the skimmers are properly

adjusted. The sludge level must be measured and recorded, and the plate packs must be inspected for solids buildup.

Before performing any maintenance on this equipment, refer to the lockout/tagout procedures described in section 10.3. Additional safety guidance and detailed instructions are provided in the CSEP Operation and Maintenance Manual found in appendix C.

- **Preventive Maintenance.** The skimmers must be adjusted as deemed necessary as a result of the monthly inspection. If they are skimming water with the product, they must be raised. If the oil layer exceeds .5 inch, the skimmers must be lowered .125 inch.

  The plate packs must be cleaned of solids buildup as deemed necessary as a result of the monthly inspection and in accordance with the direction of the project engineer. Instructions for plate pack cleaning are included in the CSEP O&M manual (see appendix C).

- **Corrective Measures**. If kept clean, the separator itself should not require any corrective maintenance. If the separated product or water is not being removed from the unit, check the operation of the appropriate transfer pumps (P-102 and P-100).

5.1.2.3 Transfer Pumps (P-100, P-101, P-102). Routine, preventive, and corrective maintenance measures are described below.

- **Routine Inspection**. Visual inspection of the internal and external parts of the pumps must be performed monthly. This includes examining the impellers, bearings, seals, shafts, packing materials, and motors for signs of abnormal wear. Pump impellers must also be checked for the presence of holes, pits, and cracks (possibly from corrosion due to cavitation).

  Before performing any maintenance on this equipment, refer to the lockout/tagout procedures described in section 10.3. Additional safety guidance and detailed instructions are provided in the manufacturer O&M manuals found in appendix C.

- **Preventive Maintenance**. Preventive maintenance must include lubrication of moving parts of the equipment such as bearings and the motor shaft. Also, all foreign debris must be removed during routine inspection as a preventive measure.

- **Corrective Measures**. All pumps requiring maintenance must be isolated from the process and drained before proceeding with maintenance procedures. In addition, the power supply to the pump must be locked out prior to any contact with the pump motor. O&M instructions included in appendix C must be consulted prior to repair of any parts of equipment during corrective maintenance.

5.1.2.4 Free Product Storage Tank (T-101). Routine, preventive, and corrective maintenance measures are describe below.

- **Routine Inspection**. The tank level must be monitored weekly by physically measurement with an interphase probe.

The weekly inspection of the totalizing flow meter (FQI-100) must include checking for any missing hardware, loose screws, a broken or scratched register lens, or any other signs of wear or deterioration. A loss in pressure coupled with a decreased flowrate may indicate that the meter screen (F-100) is clogged and needs cleaning. Fuel filter F-100 must be cleaned weekly to maintain flow into T-101.

A weekly visual inspection of the tank must include examination of nozzles, manways, flanges, gaskets, joints, and couplings of piping connections to the tank. Any leaks or cracks found must be documented and repaired immediately. The tank surface coatings also must be examined for degradation.

- **Preventive Maintenance**. Preventive maintenance activities must include periodic removal of accumulated product, based on the weekly level readings and as directed by the project engineer. In addition, any sludge that has accumulated at the bottom of the tank must be removed as deemed necessary by the project engineer.

  All dust, dirt, grease, moisture, and other foreign material must be cleaned monthly from the exterior of the totalizing flow meter. The accuracy of the meter must be checked annually or sooner if there is any indication that the gauge is not reading properly.

- **Corrective Measures**. Any system leaks or cracks must be repaired immediately. Any apparent degradation of the tank surface coating noted during the inspection must prompt repainting and recoating of said surface.

  A clogged flow meter must be cleaned in accordance with the instructions provided in the manufacturer's O&M manual found in appendix C. This O&M manual also contains procedures for calibrating an inaccurate flow element. Additionally, all worn parts must be replaced in accordance with the parts list provided in the manual.

5.1.2.5 Particulate Filters (F-100A/B). Routine, preventive, and corrective maintenance measures are described below.

- **Routine Inspection**. The pressure drop across the filter system must be monitored and documented weekly to ensure adverse conditions, such as clogged filters, have not developed. The unit must also be inspected weekly for leaks and worn components.

  Before performing any maintenance on this equipment, refer to the lockout/tagout procedures described in section 10.3. Additional safety guidance and detailed instructions are provided in the Rosedale Products O&M manual found in appendix C.

- **Preventive Maintenance**. The filter media on the unit must be replaced when the pressure drop across the system approaches 15 psi.

- **Corrective Measures**. Replace worn parts in accordance with the Rosedale O&M information located in appendix C.

5.1.2.6 Liquid-Phase GAC Units. Routine and preventive maintenance measures are described below.

- **Routine Inspection.** During the weekly site visit, the GAC units must be checked for signs of leakage and corrosion in and around the piping connections to the tanks, associated valves, and associated gauges.

- **Preventive Maintenance.** Samples must be collected weekly from sampling ports in accordance with the NPDES permit compliance sampling program discussed in section 6.0. The results of these samples will provide information regarding the performance of the GAC units, which must be reviewed by the project engineer. Upon
indication of break-through of the first carbon vessel, the current lead vessel must be changed out, the second vessel must be valved in to become the lead vessel, and new carbon must replace the spent carbon in the first vessel.

5.1.3 Vapor Treatment System

5.1.3.1 Air-Water Separator. Routine and preventive maintenance measures are described below.

- **Routine Inspection.** A weekly visual inspection must be performed in which the unit is checked for leaks.

- **Preventive Maintenance.** The float switches must be checked for moisture every 6 months and cleaned, as needed.

5.1.3.2 Transfer Pump (P-200). Routine, preventive, and corrective maintenance measures are described below.

- **Routine Inspection.** Visual inspection of the internal and external parts of the pump must be performed monthly. This includes examining the gears, bearings, seals, shafts, packing materials, and motors for signs of abnormal wear. Pump gears must also be checked for presence of holes, pits, and cracks.

  Before performing any maintenance on this equipment, refer to the lockout/tagout procedures described in section 10.3. Additional safety guidance and detailed instructions are provided in the manufacturer O&M manual found in appendix C.

- **Preventive Maintenance.** Preventive maintenance must include lubrication of moving parts of the equipment such as bearings and the motor shaft. Also, all foreign debris must be removed during routine inspection as a preventive measure.

- **Corrective Measures.** All pumps requiring maintenance must be isolated from the process and drained before proceeding with maintenance procedures. In addition, the power supply to the pump must be locked out prior to any contact with the pump motor. O&M instructions included in appendix C must be consulted prior to repair of any parts of equipment during corrective maintenance.

5.1.3.3 Vacuum Blower. Routine, preventive, and corrective maintenance measures are described below.

- **Routine Inspection**. The blower oil level must be monitored weekly and maintained at a suitable level as dictated in the manufacturers O&M manual included in appendix C. Filters F-300 and F-301 must be visually inspected weekly to prevent blower failure due to a clogged filter. The weekly inspection also must include checking the unit for hot spots and unusual noise or vibration.

  Before performing any maintenance on this equipment, refer to the lockout/tagout procedures described in section 10.3. Additional safety guidance and detailed instructions are provided in the manufacturers O&M manual found in appendix C.

- **Preventive Maintenance**. The drive end bearings must be lubricated every week per instructions in the manufacturers O&M manual in appendix C. In addition, the oil must be changed every six weeks as directed in the manual. Filter F-200 must be changed, as deemed necessary by the results of the weekly inspection. The exterior of the blower motor must be inspected weekly for cleanliness and must be cleaned as required. The motor grease must be checked every three months for quality and must be maintained, as required.

  In a belted drive system, the belt tension must be checked weekly and belts must be inspected for fraying or cracks.

- **Corrective Measures**. Seals are subject to deterioration and may require periodic replacement. Detection of spot heating must prompt an inspection of the impeller to ensure it is not rubbing against the cylinder headplate. Such a condition must be rectified as described in the manufacturers O&M manual in appendix C. Directions for replacing timing gears, shaft bearings, and impellers are also found in the manual. Causes of any other problems detected during routine inspection can be determined in accordance with the troubleshooting guide provided on page 9 of the company's O&M manual.

5.1.3.4 Air Heat Exchanger. Routine, preventive, and corrective maintenance measures are described below.

- **Routine Inspection**. The inlet and outlet areas of the unit must be inspected weekly for leaks. The bottom fins must be inspected weekly to maintain clear passages. Blocked fins can result in inefficient cooling capacity.

  Before performing any maintenance on this equipment, refer to the lockout/tagout procedures described in section 10.3. Additional safety guidance and detailed instructions are provided in the XChanger O&M manual found in appendix C.

- **Preventive Maintenance**. The unit's motor is factory lubricated for normal bearing life, so its lubrication is not included in the preventive maintenance schedule. Air passages must be cleaned every six months using Alconox and water or compressed air. Pressure washers could damage the fins and must not be used. The inlet filter must be replaced as deemed necessary by the monthly inspection results.

- **Corrective Measures**. If the process gas passages become clogged, the core likely will require replacement. The unit will have to be returned to the factory for this service.

5.1.3.5 Vapor-Phase GAC Units (T-201 and T-202). Routine and preventive maintenance measures are described below.

- **Routine Inspection.** During the weekly site visit, the GAC units must be checked for signs of leakage and corrosion in and around the piping connections to the tanks, associated valves, and associated gauges.

- **Preventive Maintenance.** Samples must be collected monthly from sampling ports in accordance with the SCAQMD permit compliance sampling program discussed in section 6.0. The results of these samples will provide information regarding the performance of the GAC units and must be reviewed by the project engineer. Upon indication of breakthrough of the lead tank, the second tank will be valved-in to become the lead tank. New carbon will replace the spent carbon and the former lead. Vessel will be connected to take position as the second tank.

5.1.4 Compressed Air System

5.1.4.1 Air Compressor. Routine, preventive, and corrective maintenance measures are described below.

- **Routine Inspection.** The compressor oil level must be monitored weekly and maintained at the proper level. A weekly check must be conducted for unusual noise or vibration of the system as well. The unit must be inspected at this time for proper V-belt tightness, properly operating safety valves, and intake filter cleanliness.

  Before performing any maintenance on this equipment, refer to the lockout/tagout procedures described in section 10.3. Additional safety guidance and detailed instructions are provided in the Ingersoll-Rand O&M manual found in appendix C.

- **Preventive Maintenance.** During the weekly inspection, all dust and dirt must be cleaned off of the unit, and the air intake filters must be removed and cleaned, if required. At this time, the safety valves must also be checked to ensure that they do not stick. The automatic tank drain must be manually drained once a week, as well. The intercooler exterior and cylinder cooling fins must be cleaned at this time

During the monthly inspection, the unit must be checked for leakage and for belt wear and adequate tension. The compressor oil must also be checked for contamination and be changed, if necessary. To prevent dirt accumulation, the motor windings must be blown off with compressed air at this time. The compressor's monthly preventative maintenance schedule also must include checking and cleaning (as required) the valves and regulator, tightening nuts and cap screws, checking the operation of the pressure relief valves, cleaning the air-cooled aftercooler exterior, and checking the function of the automatic drain and the low oil monitor as detailed in the Ingersoll-Rand O&M manual found in appendix C. At this time, the crankcase oil must be changed as specified in the Ingersoll-Rand instruction manual located in appendix C, and the entire system must be checked for air leakage around fittings, connections, and gaskets using a soap solution and brush.

The ball bearing motor must be repacked with grease annually. During this annual overhaul, the intercooler tubes must be removed from their headers and inspected internally for signs of wear or buildup.

- **Corrective Measures**. Loss of air pressure, when the machine is idle and no air is being used, usually indicates that the check valve is not seating. This is caused by dirt or other foreign matter accumulating between the seat and disc. With the power off and the air drained from the tank, the check valve must be serviced by removing the valve, cleaning its interior, and checking the valve disc.

  If the motor fails to cut in, the oil level in the crankcase should be checked for adequate level. If the oil level is satisfactory, the malfunction is likely traceable to the automatic pressure switch, which may require replacement.

  If the low oil level switch is malfunctioning, it must be removed, cleaned, and tested prior to replacement. If the switch fails the test, the unit must be replaced.

5.2 Lubrication

It is imperative that all personnel performing lubrication preventive maintenance on any part of the system are familiar with the Operation Safety Manual and maintain a complete understanding of this manual's section 10.0. Section 10.3 lockout/tagout procedures must be referenced prior to performing any lubrication on this system. In addition, the operator must refer to the manufacturer's O&M manual found in appendix C for equipment specific safety protocol.

Proper lubrication of equipment is essential for efficient operation. Table 5-1 contains information on appropriate lubricants for each piece of equipment. The proper method for lubrication is described in manufacturers' O&M manuals found in appendix C and in the following general procedures:

1. Follow the lockout and tagout safety procedure in accordance with section 10.3. However, some of the fan bearings and motors must be greased while in motion. Safety procedures applicable to this energized maintenance must be followed.

2. Ensure the grease gun is clean.

3. Clean the grease fitting with a clean rag. If a plug is to be removed, clean the area around the plug before removal of the plug, and insert grease fitting.

4. Remove any relief plug or vent before pumping grease.

5. Wipe off all excess grease around the unit.

6. Clean the vent before replacing the vent plug to allow for expansion of grease and to allow excess grease to work out of the bearing.

7. Note in the maintenance records the date, the name of operator or service personnel, and what was done to the equipment.

5.3 Alarm Responses

The control system, as described in section 3.6 interfaces directly with the process equipment and identifies emergency or alarm conditions in the treatment facility. In the event of such a condition, an audible alarm will sound at the treatment site. In the event of an emergency or alarm condition during unattended hours of the treatment system, an auto-dialer system initiates a series of telephone calls to alert the operator of the condition so that corrective action may be taken. The off-site operator calls into the system to acknowledge the alarm and respond, as necessary. Alarm conditions are described in section 4.3.

6.0 PERFORMANCE MONITORING

Performance monitoring is necessary to evaluate the effectiveness and efficiency of the system during operation. Some parameters measured as part of the performance monitoring effort will directly indicate if the system is performing inadequately, while others may suggest likely non-performance occurances and their likely causes. Such parameters can be monitored by a direct reading field instrument and by periodic sampling and analysis of influent and effluent streams. Field instruments that constitute a part of the system instrumentation include liquid levels indicators, pressure and temperature gauges, and flow totalizers.

6.1 Operating Parameter Measurement

Part of the performance monitoring requirements are to measure and monitor the operating parameters of the system. These parameters include: pressure, temperature, and flow rates in the injection and extraction piping and wells, differential pressure across the duplex filters, and liquid levels in the various tanks. The monitoring of these parameters must be performed in accordance with the following schedule:

- a minimum of three times during system startup
- once daily during the first week following startup
- once weekly during normal operations

Data must be recorded on the weekly monitoring log sheet provided in appendix B. Base line data must be recorded immediately after the system reaches steady state operation.

6.1.1 Bio-Vent System

Performance monitoring of the bio-venting system includes monitoring temperature, pressure, flow, and liquid levels.

- **Temperature**. Temperature is monitored in the air injection headers (TI-317 through TI-320) and at each individual well (TI-301 through TI-316) with an in-line temperature gauge.

- **Pressure**. Pressure is monitored within the injection system at each well and for the total system. Pressure gauges (PI-301 through PI-316) measure the total pressure at each of the injection wells, and pressure gauges (PI-317 through PI-320) have been installed on the air injection headers as well. They are monitored to identify zones where flow is not sufficient.

- **Flow**. A flowmeter has been installed in the air injection header lines (FE-317 through FE-319). In addition, flow elements have been installed at each injection well (FE-301 through FE-316) to reflect air injection rates. The data collected from these instruments help to ensure that the air is being dispersed properly throughout the vertical section of the subsurface and allow identification of potential air injection problems.

- **Liquid Levels**. The depth to groundwater and floating product thickness in the injection wells must be measured monthly in the product recovery wells. The liquid levels are measured with an electronic interface probe (IP) capable of differentiating between petroleum product and water.

The IP must be decontaminated after each use by washing in a solution of Alconox detergent and water. The well gauging data can be used to monitor the depth, shape, and areal extent of the groundwater capture zone, as well as changes in product thickness with time. The data must be recorded on well gauging forms contained in Appendix B.

6.1.2 Groundwater and Product Recovery System

Performance monitoring of the groundwater and product recovery system includes monitoring pressure, flow, and liquid levels.

- **Pressure**. A pressure gauge (PI-100) has been installed at the inlet to the particulate filters to provide pressure reading on the discharge of P100. A pressure indicator (PI-102) has been installed at the outlet of the filters to allow the operator to check differential pressure. This parameter must be measured as a means to monitor the effectiveness of the filters and to indicate the need for filter replacements. PI-101, located at the effluent transfer pump outlet, indicates the total treated water effluent pressure.

- **Flow**. FE-FQI-100 is a totalizing flowmeter that has been installed on the inlet to the product tank T-101. This gauge provides a total of product recovered from the extraction wells. This parameter must be monitored to evaluate the effectiveness of the total fluid recovery pumps and to ensure that the treatment system has sufficient capacity to remediate the extracted fluids.

  The totalizing flowmeter (FE/FQI-101) at the effluent pump outlet will provide total treated water output information that must be used in discharge water permit reporting requirements.

- **Levels**. An IP is used to measure the depth to liquid below the top of the tank. The volume of recovered product is determined by the tank gauging data and the dimensions of the tank. This information will be used to determine the rate of free product collection in order to schedule its removal for disposal.

6.1.3 Vapor Extraction and Treatment System

Performance monitoring of the vapor extraction and treatment system includes monitoring temperature, pressure, and flow.

- **Temperature**. Temperature gauges (TI-200 through TI-208) have been installed in the vapor outlet line of each of the eight recovery wells (RW-1 through RW-8). In addition, a temperature gauge has been installed on the vapor extraction header (TI-209) to monitor vapor treatment system influent temperature, while TI-210 provides system effluent temperature.

  Temperature gauge TI-211 has been installed at the outlet of the vapor extraction blower to provide information regarding the need to cool the blower outlet stream prior to the stream's entrance to the GAC units. Cooling is provided, as needed, by the heat exchanger installed at the inlet of the GAC system.

- **Pressure**. Pressure gauge fittings have been installed on the eight vapor extraction lines (PI-201 through PI-208) located in each of the vapor extraction wells. These fittings provide data that are used for balancing the vacuum induced in each of the vapor extraction wells. PI-209 has been installed on the vapor extraction header to provide treatment system inlet pressure.

- **Flow.** Vapor extraction header flow elements (FE-209 and FE-210) provide the vapor treatment system influent flow rate. A flowmeter (FE-211)has been installed at the outlet of the second GAC vessel to provide the treatment system effluent flow rate.

6.1.4 Compressed Air System

Performance monitoring of the compressed air system involves monitoring the pressure on the unit's output to the total fluid recovery pumps.

- **Pressure.** The compressor outlet pressure gauge (PI-400) monitors the unit output to the total fluid recovery pumps. These data are used to monitor the performance of all of the total fluid recovery pumps. Increases in pressure requirements to maintain a hydrogeologic capture zone may indicate that the pumps require maintenance.

6.2 Sample Collection and Analysis

A major portion of the monitoring effort is to continuously evaluate the overall system effectiveness in contaminant extraction and treatment. This is accomplished by periodic sampling and analysis of the water and air/vapor waste streams. Water and air sampling is also necessary to ensure compliance with the permit to construct and operate the treatment area and the wastewater discharge permit.

Samples must be collected from sampling ports installed upstream and downstream of the water and air treatment equipment. In addition, groundwater in the site's monitoring wells must be sampled periodically to evaluate the system's effect on groundwater quality. The sampling frequency, procedures, and analytical methods to be used are described below. Table 6-1 summarizes the compliance monitoring sampling plan.

6.2.1 Wastewater Sampling

Wastewater samples must be collected downstream of the liquid-phase GAC units on a weekly basis from a sampling port. This water is comprised of treated groundwater from the pumping wells and treated condensed water vapor from the vapor extraction system. The samples must be tested for Total Petroleum Hydrocarbons (TPH), Benzene, Toluene, Ethylbenzene, Total Xylenes (BTEX), ethylene dibromide, and oil and grease, in addition to the physical characteristics of temperature and pH. If test results of these constituents consistently show full compliance with the effluent limitations for at least three months, the frequency of testing can be reduced to a monthly cycle unless otherwise specified by the CRWQCB executive officer. However, the frequency of analysis must revert back to a weekly schedule should any of the monthly samples exceed effluent limitations. If the results of all wastewater sampling show full compliance with the effluent limitations for 12 months, the frequency of analysis may be further reduced to bi-monthly unless otherwise specified by the CRWQBC executive officer.

In addition to the weekly effluent sample described above, a sample must be collected each week from a midpoint sample port between the GAC units. This sample must be tested for TPH and BTEX, and the results used to determine when breakthrough of the lead GAC vessel has occurred. Indication of such break-through must prompt the replacement of the lead unit with the second unit and replacement of the second unit with a fresh GAC vessel.

In addition to the weekly effluent and intermediate sample described above, a sample must be collected each week from the inlet sample port prior to the GAC units. This sample must be tested for TPH and BTEX, and the results used to determine the pounds of hydrocarbon removed from the subsurface.

Monthly samples of the system liquid effluent must be tested for total dissolved solids and turbidity and for the presence of chloride, sulfate, sulfides, and nitrogen.

Samples collected on a quarterly basis from the system effluent sampling port must be tested for suspended solids and settleable solids and analyzed for lead.

The annual system effluent sample must be analyzed for biological oxygen demand (BOD @ 20°C), phenol, phenolic compounds (chlorinated), and toxicity. If the results of the annual toxicity test yield a survival rate of less than 90 percent, the frequency of analysis must be increased to a monthly schedule until at least three consecutive test results have been obtained and full compliance with Effluent Limitations I.3 have been demonstrated.

The samples must be collected by trained personnel in accordance with applicable Government Services, Inc. (GSI) standard operating procedures and EPA guidelines. Samples for TPH analysis must be collected in 1-liter amber glass bottles with HCl preservative and teflon-lined caps. Samples for BTEX analysis must be collected in 40-ml glass VOA vials w/ HCl preservative and teflon-lined septum caps. The wastewater samples must be collected during normal flow conditions through the GAC units. The VOA vials must be filled completely to eliminate head space.

The water samples must be placed in a cooler containing ice for delivery to the analytical laboratory. A chain of custody form must be completed for each set of samples; and must accompany the samples to the laboratory. The samples must be analyzed and the results reported within five business days of sample receipt at the laboratory.

6.2.2 Air Sampling

Air samples must be collected on a weekly basis upstream and downstream of the vapor-phase GAC units (T-201, T-202) and from between the GAC units at. These samples must be field screened for VOC concentrations using a GA-90 infrared detector. Calibration of this instrument must be documented for each use. A VOC concentration in excess of 50 % of the sample obtained from the lead GAC unit outlet must prompt the replacement of the lead GAC unit with the second GAC unit and replacement of the second GAC unit with a fresh unit. All readings must be recorded on the weekly monitoring logsheet (appendix B). Samples must be collected monthly from the inlet, intermediate and outlet and tested for TPH and BTEX. These concentrations will aid in the determination of the mass of VOC removed during that time period.

7.0 HOUSEKEEPING AND WASTE HANDLING

7.1 Housekeeping

Good housekeeping practices must be maintained at all times to ensure operator safety and prevent equipment failures or accidents. The treatment area must be kept clean and clear of any liquid, debris, trash, or other waste substances. Hazardous materials must be properly stored in designated storage areas. The stored items must be properly labeled according to current government regulations on hazardous materials. These labels or placards will warn any personnel having potential contact with these materials.

All walkways and emergency routes must be kept clear of obstacles during the operation. Adequate lighting in and around the treatment compound must be maintained during night hours. Trash, debris, and waste materials considered non-hazardous must be deposited in appropriate enclosed containers outside the treatment area.

7.2 Waste Handling

Solid waste generated during the project must be stored, transported, and disposed of in accordance with applicable state and federal regulations and requirements. None of the waste streams is considered potentially hazardous or dangerous per state and federal regulations. However, proper handling must be performed to minimize the potential for contamination and worker exposure until samples are collected and confirmatory laboratory analytical results are received.

7.2.1 Filter Solids

Solids contained inside the filter bags may be potentially contaminated. During filter change-out, spent filters must be placed in closed-top, Department of Transportation (DOT) approved drums (55 gallons), roll-off bins, or tanks. Non-regulated waste labels initially must be placed on the containers and placed in areas that do not restrict site access.

Initially, composite filter solid samples must be collected to characterize the waste. Since the waste may be considered as dangerous or hazardous, the storage time, therefore, will be subjected to the 90-day period for hazardous (or dangerous) waste accumulation. Pending sample results, spent filters must be sent to the appropriate facility for disposal. If the filter materials are classified as dangerous or hazardous, the containers must be relabeled with restricted waste labels (e.g., hazardous waste, etc.), and proper manifests must be prepared and completed prior to waste transportation and disposal.

7.2.2 Sludge

Sludge which accumulates at the bottom of the oil-water separator must be periodically removed and stored in 55-gallon drums. Samples must be analyzed to characterize the material for proper disposal. Since the waste may be considered as dangerous or hazardous, the storage time, therefore, will be subjected to the 90-day period for hazardous (or dangerous) waste accumulation. Pending sample results, the waste material must be sent to the appropriate facility for disposal. If it is classified as dangerous or hazardous, the containers must be relabeled with restricted waste labels (e.g., hazardous waste, etc.), and proper manifests prepared and completed prior to waste transportation and disposal.

7.2.3 Recovered Petroleum Hydrocarbons

Recovered petroleum hydrocarbons will be stored in a 500-gallon, aboveground fuel oil holding tank (T-101). The recovered petroleum hydrocarbons must be removed from the tank within the allowable 90-day period for hazardous waste accumulation using a pump truck and transported to the administration area for recycling or disposal.

7.2.4 Spent Cleaning Solutions

Whenever possible, a solution of Alconox detergent and water must be used to clean or decontaminate treatment and sampling equipment. However, certain cleaning jobs may require the use of solvents (e.g., mineral spirits, methanol) for effective cleaning. When spent, these solvents may constitute a listed dangerous or hazardous waste. Any such listed dangerous or hazardous wastes must be properly stored, documented, and disposed of in accordance with applicable state and federal regulations and procedures outlined previously for hazardous waste disposal. Spent Alconox/water solutions generally do not require handling as a dangerous or hazardous waste unless the solution was used to clean residue of a known dangerous or hazardous waste from a piece of equipment. Nonhazardous Alconox/water solutions may be pumped into the oil water separator for treatment.

7.2.5 Spent PPE and Sampling Supplies

Spent protective personal equipment (PPE) and disposable sampling supplies generally do not require handling as a dangerous or hazardous waste unless the materials contain residue of a known dangerous/ or hazardous waste. Ordinarily, spent PPE and sampling supplies must be discarded in the on-site refuse bin for disposal. If classified as dangerous or hazardous waste, the PPE and sampling supplies must be properly stored, documented, and disposed of in accordance with applicable state and federal regulations and procedures outlined previously for hazardous waste disposal.

8.0 TRAINING

Personnel training is necessary to ensure that operating personnel possess the proper skills and knowledge to operate and maintain the system safely. All employees involved with the system operation and maintenance must receive adequate safety training which complies with OSHA 29 CFR 1926.20 prior to engaging in these activities. Individuals who plan to work in areas where safety or health hazards exist must have completed an annual 8-hour OSHA refresher training course and/or initial 40-hour OSHA training course within the last year prior to performing any such work. Safety training must focus on both ordinary and emergency situations and must include topics discussed in earlier sections. Documentation of medical clearances, hazardous waste operations and supervisory instruction, supervised field experience, and any refresher training must be available at the site.

In addition to safety training, training must be conducted in the operation and maintenance of system equipment. Such training must cover system and equipment startup and shutdown (automatic and manual), process parameters monitoring, and equipment maintenance and troubleshooting. All records of equipment operation and maintenance training must be maintained in a similar manner to the safety training records. A personnel training documentation form for recording specific types of training received is provided as table 8-1.

9.0 RECORD KEEPING

9.1 Operations Documentation

9.1.1 System Parameters

The system operator(s) are responsible for the weekly monitoring of the system as described in section 6.0. All data gathered must be recorded on the weekly monitoring log sheet for each system. An example of the form is included in appendix B.

9.1.2 Well Elevation Data

In accordance with the groundwater permit, groundwater samples and water table elevations must be obtained from the perimeter groundwater monitoring wells. The water table elevations are used to generate groundwater level contour maps to include in the quarterly status and monitoring reports. The well elevations log sheet located in appendix B, must be used for monitoring well data recording.

9.1.3 Laboratory Data

Laboratory results from the system sampling must be summarized in the monthly status and monitoring reports. The original lab reports are kept in a central file in GSI's Torrance office.

9.1.4 Personnel

On-site personnel management is an important part of the efficient and safe operation and maintenance of the technology demonstration system. The ability to easily identify and locate staff at the site is essential in order to meet site health and safety protocols. Personnel management must include the recording of operator time on-site as well as visitors and security personnel.

9.2 Maintenance Documentation

Documentation of any maintenance is a critical aspect of the total maintenance plan. Maintenance documentation for records will be established for both preventive and corrective maintenance. Samples of preventative maintenance log sheets for weekly and monthly service are provided in appendix B. Documentation of any corrective action must be handled in the form of a work task sheet (appendix B). A copy of the work task sheet will be kept in the central project file. A history of all maintenance performed on the equipment in conjunction with the preventative maintenance schedule (table 5-1) can be useful in determining when maintenance is required.

9.3 Waste Disposal Documentation

Records pertaining to waste disposal must be maintained in the central project files in GSI's Torrance office. These records must include, but not be limited to, generator waste profiles, analytical results, waste manifests, bills of lading, waste acceptance or approval letters, and certificates of disposal. Telephone conversation logs and correspondence related to waste disposal also must be maintained in the site and central project files. In addition, a waste log must be maintained on site which lists, for each waste stream generated, the name and source of the waste, accumulation date(s), quantities, regulatory designation, storage location, sampling dates, and destination laboratory (if applicable), profiling status, and disposal status. Examples of all waste disposal records are included in appendix B.

10.0 OPERATION SAFETY MANUAL

This section, along with the referenced appendices, have been designed as the "pull-out" Operation Safety Manual (OSM) to be viewed as an addendum to the Site Specific Health and Safety Plan (SHSP) specifically for the operation of the DFSP San Pedro pump house area remediation project. The OSM provides health and safety protection for operators of the treatment system through careful evaluation of potential hazards, the selection of and use of proper personal protective and monitoring equipment, and careful training and supervision of employees. Each employee is responsible for personal safety as well as the safety of others in the area. Employees must use all equipment provided in a safe and responsible manner as outlined in this OSM. All personnel must follow the policies set forth in this OSM and the rest of this O&M manual, including the vendor supplied O&M manuals in appendix C and D.

10.1 Maintenance of Equipment

Equipment hazards will be minimized for the operations and maintenance of the treatment system by the proper implementation of this OSM and the rest of the O&M manual. Potential equipment hazards related to the operation and maintenance of the processing systems and related equipment are as described in further detail below.

10.1.1 Air-Air Heat Exchanger

Although safety features are included in the design of the heat exchanger, staff must use manufacturer standard operating procedures (SOPs) for all work around this equipment. Contact with hot surfaces is a potential hazard when dealing with the heat exchanger. Due to the rotation of the cooling fan on this unit, airborne dust may present a problem in this area. The site health and safety officer (SHSO) must determine if this is the case and what PPE upgrades will be necessary. Although all moving parts are guarded and covered, at no time should any person work on or around the heat exchanger wearing loose clothing or jewelry.

There are other potential hazards as well. As is the case for most of the facility, it is anticipated that excessive noise will be a concern during operation of the system. Proper hearing protection must be worn by all personnel. Staff should also be aware of sharp edges on the unit and be alert when walking in the vicinity of inlet and outlet piping as these may present a trip hazard. Lockout/tagout procedures must be implemented and followed for all non-routine work.

10.1.2 Oil-Water Separator

Operators must use manufacturer SOPs for all work around this equipment. Due to the high potential for contaminant exposure when maintaining the separator, the PPE outlined in the SHSP and the SOPs must be required for any maintenance of the oil-water separator. Although all moving parts on the transfer pumps associated with the separator are guarded and covered, workers must be careful of moving shafts, no loose clothing or jewelry is permitted. Lockout/tagout procedures must be implemented and followed for all maintenance or other work performed. While working on the oil-water separator, great care must be used while handling the heavy, potentially very slippery parts of the unit. As is the case for the entire facility, hearing protection must be worn in accordance with standard policy. Caution should be employed while walking around the inlet and outlets of the separator and associated pumps. When the main separator chamber is open to check levels or watch operation and incoming fluids, the breathing area must be monitored with an FID to ensure the levels of hydrocarbon vapors are safe. With the separator chamber open a floating level of product will be approximately 2 feet from the breathing zone.

10.1.3 Free Product Storage Tank

The main safety concerns around the product storage tank are tripping over piping and exposure to potential contaminants. Proper PPE outlined in the SHSP and the SOPs is required for any maintenance of the product storage tank. Lockout/tagout procedures must be implemented and followed for all maintenance or other work performed.

10.1.4 Total Fluid Recovery Pumps

Caution must be exercised when working on the total fluid recovery pumps. Trip hazards exist on the pump piping. Since the pumps use air pressure to actuate, extreme care must be taken to ensure no pressure remains in the lines prior to disconnecting. The same care must be taken when removing the fluids lines. Contaminant exposure is a possibility during maintenance of the pumps. Lockout/tagout procedures must be strictly enforced. Questions on the repair and troubleshooting of the pumps should be directed to the manufacturers' literature included in the O&M manual, appendix C.

10.1.5 In-Line Filter

When working with the in-line filter system, personnel must wear appropriate PPE as contaminant exposure is possible. Also, all waste handling of filter solids should be handled accordingly and disposed of as recommended in section 7.0. Manufacturer literature should be consulted prior to maintenance to ensure safety procedures are followed. Caution must be taken around all associated piping to avoid trips and falls. Lockout/tagout procedures must be implemented and followed for all maintenance or other work performed.

10.1.6 Vacuum Blower and Bio-Vent Blower

Operators must use manufacturer SOPs for all work around this equipment. The PPE outlined in the SHSP and the SOPs is required for any maintenance. Although all moving parts of the blowers are guarded and covered, at no time should any personnel work on or around the blowers while wearing loose clothing or jewelry. It is anticipated that excessive noise will be a concern during operation of the blowers. Therefore, proper hearing protection must be worn by all personnel. Personnel also should be aware that since the vapor extraction system functions using vacuum pressure, all lines must be free of vacuum prior to the commencement of work on either the unit itself or the air-water separator. Personnel should also be aware that the biovent system functions using pressure, all lines must be free of pressure prior to the commencement of work on either the unit itself or the associated piping manifold. When walking in the vicinity of inlet and outlet piping, personnel must remain alert to avoid trip hazards. Lockout/tagout procedures must be implemented and followed for all maintenance and routine work.

10.1.7 Transfer Pumps

The transfer pumps incorporated in the treatment system present trip hazards as some of them are mounted directly onto the concrete pad surface. All piping associated with the pumps may also present trip hazards, and personnel should be aware of this. Although all moving parts of the pumps are guarded and covered, at no time should any personnel work on or around the transfer pumps while wearing loose clothing or jewelry. As is the case for most of the facility, it is anticipated that excessive noise will be a concern during operation of the system. Proper hearing protection must be worn by all personnel. Proper PPE also must be worn to avoid contaminant exposure. Transfer pumps must be allowed to cool prior to work being undertaken. Lockout/tagout procedures must be implemented and followed for all maintenance and routine work.

10.1.8 Compressor and Compressed Air

The connection, removal, and maintenance of the compressor and compressed air lines will be controlled by facility personnel in accordance with detailed instructions contained in this O&M manual. The compressor receiver tank and all air lines must be relieved of pressure prior to any maintenance activities. Proper hearing protection must be worn by all personnel. Lockout/tagout procedures must be implemented and followed for all maintenance and routine work.

10.2 Electrical

Only trained electricians are to be allowed to perform electrical repairs. The main power source of the section or equipment to be worked on must always be opened, locked out, tagged out, and tested. Check components for power with the volt-ohm-milliamp meter (VOM).

10.2.1 Electrical Shock

Electrical shock occurs when the body becomes part of an energized electrical path and energy is transferred between parts of the body, or through the body, to a ground or the earth.

Current flowing through the central nervous system, under certain conditions, can cause serious injury or death. Conditions which cover the severity of a shock are as follows:

- The type of current involved is important. Low voltage (up to 24 volts) and direct current (DC) circuits do not normally present a hazard to human life; however, under some circumstances, severe burns can result. Even at low voltage (just above 24 volts) alternating current (AC) circuits can be dangerous and present a lethal threat.

- The resistance of the body and the degree to which the skin is insulated from the ground govern the amount of current flowing through the body. The skin offers the principal resistance which the human body presents to the flow of current.

- Time becomes critical when electricity flowing through the body causes loss of muscular control, contraction of the chest (which affects breathing), or ventricular fibrillation of the heart. When the last occurs, the heart's pumping rhythm becomes irregular, and it ceases to function properly.

- Both the magnitude and path of the current flowing through the body are of primary importance. When the path of the current is hand-to-hand, vital organs (brain, heart, lungs, spinal cord) are affected, possibly with serious consequences.

10.2.2 Emergency Measures for Shock

Everyone in or around any electrical or electronic work must be capable of carrying out the following measures:

- Cut off the power. Because of the dangers involved in being caught in a live circuit, personnel must know how to cut off the power anywhere in work area and how to summon help in case of an emergency.

- Administer cardiopulmonary resuscitation (CPR). Personnel must summon someone who CPR is qualified and get professional help.

- Immediately report any shock received, no matter how slight, to the supervisor. Personnel must promptly report any "popping" or sparking as well as any noticeable defects or hazardous conditions that could cause injury, property damage, or interference with service.

10.2.3 Preventive Measures

When working with or around electrical equipment, personnel must assume responsibility for their own safety and the safety of those working with them. The following information, principles, and good working practices will help to avoid electrical shock and injury. Electrical hazards can be eliminated through:

- grounding (earthing) and bonding
- isulation
- isolation
- personal safety techniques and practices
- use of ground fault circuit interrupters (GFCI)

10.2.4 General Procedures to Avoid Shock

In general, to avoid shock, personnel must keep their hands off connected electrical apparatus with which they are not directly involved or familiar. Unauthorized people must not be allowed to work in hazardous areas. Any employees entering areas in which they do not usually work should check with whomever is in charge, state their reasons for being there, and receive clearance to perform their duties or to visit. Other actions may include:

- Questioning the methods or procedures of fellow workers if they violate any safety practices or otherwise work in an unsafe manner.

- Providing signs and barriers to warn people of high voltage hazards. Danger signs and flashing lights must be posted in a highly visible place wherever conditions require them. They should not be left where danger no longer exists, as this detracts from their effectiveness.

- All warning signs must be obeyed.

- Safe working distances around energized equipment must be maintained at all times. A minimum of 36 inches should be maintained on all working sides of equipment operating at 600 volts or less.

- A neat, clean work space is essential where work on electrical equipment is to take place. Spaces behind and under consoles or power supplies must never be used for storage, and should always be kept clear of rubbish or unnecessary equipment NEC (Article 110-16(b).

- Equipment found to be defective must be labeled as such before storing. Defects must be listed on a tag. The tag must remain on the equipment until it is repaired, replaced, disposed of, or dismantled.

- The electrical assembly must be installed in a neat and professional manner. Personnel should work deliberately and carefully and verify connections, being sure that they are secure.

- Personnel must avoid exposed wiring or placing any part of their body in a circuit, either to ground or across terminals. The SHSO must be notified immediately if exposed wiring is observed.

- Personnel must always connect from the load to the source, disconnecting first at the source and working toward the load.

- Personnel must check the supply circuit voltage to see that it is what is expected, either AC or DC, before closing circuits.

- Personnel must not use electrical equipment or tools where there is moisture present unless the equipment or tools are designed to be used in such an area. They should use GFCI at all times in process areas and outside.

10.2.5 Other Personal Injuries

- **Burns** from arcs can be severe. Personnel must never close a switch slowly or hesitatingly, as arcing may result. They must use a face shield and arm length gloves when operating any electrical power controls or sources that are not fully enclosed.

- **Personnel must avoid exposing your eyes to electric arcs**, for they are powerful generators of ultraviolet light, including wavelengths that can cause serious and painful injury in eyes, even after very brief exposure.

- **Personnel must keep faces away form circuit breakers as they may arc - to avoid burns**.

- Personnel must wear safety glasses or eye shields when soldering.

- Personnel must run power cables in cable ways, beneath floors, or overhead in such a manner so as to prevent tripping hazards.

10.2.6 Ground Fault Circuit Interrupters

Circuits and equipment monitored by fixed or portable GFCIs are intended to offer personal protection against electrical shock. If a worker should contact a GFCI-protected circuit conductor or energized surface while part of his or her body is grounded, the GFCI will respond by cutting off power before shock or serious injury can occur.

10.3 Lockout/Tagout Procedure

Before working on any system or circuit at the site, it is the responsibility of the person performing the work to properly isolate, de-energize, and lockout/tagout the equipment. It is the responsibility of the SHSO to

ensure that all personnel who may have to isolate a system are trained either to perform lockout/tagouts (authorized personnel) or to notify authorized personnel to ensure lockout/tagouts are used.

The only exceptions to this program are as follows:

- Work on cord and plug connected electrical equipment where the plug is under the control of the employee performing the work (such as small power tools).
- Work involving minor changes and adjustments to equipment during routine operations (such as small tooling adjustments).
- Troubleshooting of equipment where power is required to determine problem.

10.3.1 Locks and Tags

Information regarding the proper use of locks and tags follows:

- Authorized personnel must use individually keyed locks to implement a lockout.
- A lockout tag also must be used, and a tag must accompany each lock.
- Each person placing a lock and tag on a piece of equipment must sign and date the tag. In the remarks section of the tag, the person must write the lock number and identify the equipment being locked out.
- Tags should be attached with a nylon tie wrap.

10.3.2 Lockout/Tagout Sequence

The sequence for locking out or tagging out equipment is described below. Personnel must follow these procedures carefully, completely, and precisely.

1. Notify SHSO and all affected personnel.
2. Survey/check the area to ensure it is safe to shutdown and lockout (housekeeping, tools, other maintenance and inspections, etc.).
3. Follow the pipeline breakage procedure, if necessary.
4. Cycle the equipment to the correct or required position.
5. Follow normal shutdown sequence.
6. Isolate the energy from the system.

NOTE: Isolating energy sources may include operating electrical disconnects (not on/off switches); blinding pipe flanges; positioning double block/bleed valves; removing mechanical linkages; etc.

7. Apply locks and tags. Follow these rules:

   - Lock/tag all energy isolation sources that affect the equipment to be worked on or in.
   - Be sure employee has individual control over the system(s) being locked out. For instance, if two mechanics are working on a pump, each must have his or her own lock on the disconnect switch and on the valves.

   NOTE: Where several people are involved in a lockout procedure that requires locks and tags on numerous energy isolation devices, the Group Lockout procedure may be employed (see section 10.3.3).

   - Be sure authorized personnel who do not have permanently assigned locks sign them out from the SHSO.
   - Lock and tag the energy isolation device. Keep the key.

8. Control stored energy. Examples include:

   - Inspect system to make sure all parts have stopped moving.
   - Install ground wires.
   - Relieve trapped pressure.
   - Block or brace parts that could fall because of gravity.
   - Block parts in hydraulic or pneumatic systems that could move due to loss of pressure.
   - Bleed lines and leave vent valves open.
   - Drain process piping and close valves.
   - Block lines where there is no valve using flange blinds.
   - Purge vessels and process lines.
   - Dissipate extreme cold or heat or wear protective clothing.
   - Monitor systems that can accumulate stored energy.

9. Verify equipment isolation by trying to start it up with all personnel in the clear.

   WARNING: Shut off all controls after the test before beginning the maintenance work.

10. Remove guards and begin work.

11. When complete, remove blocks and barriers and replace guards. Check area for personnel and tools.

12. Notify affected personnel of re-energization.

    CAUTION: Be sure all controls are in the neutral or off position.

13. Remove all locks, blocks, and tags.

14. Re-energize equipment.

15. Use/test the equipment to make sure the equipment is operating properly.

16. Return locks and tags to SHSO.

10.3.3 Group Lockouts

When several people are scheduled to work on a system requiring several energy isolation devices to be locked out, the following group lockout procedure may be implemented:

1. The SHSO places his/her locks (master keyed) and tags on all energy isolation devices. He/she then places the master key inside a lockbox.

2. Authorized employees place their individual locks and tags on the lockbox.

3. Where more than one lockbox is utilized, both the lockbox and red locks are identified with the same number.

NOTE: **Authorized employees should verify that the supervisor has followed the appropriate lockout procedure for the equipment in question before affixing their locks to the lockbox.**

10.3.4 Failure to Clear a Lockout

- If a person should fail to clear a lockout and his/her lock remains in place, the SHSO must attempt to contact the person who applied the lock and resolve the issue.

- If the person cannot be contacted, the SHSO must investigate the situation and determine that removal of the lock will not create a hazard in the work zone. The SHSO must then verify that the work zone is clear, any blocking devices have been removed, and the system has been restored to normal configuration. The SHSO may then cut the lock off and restore energy to the system.

- A written incident report must be prepared by the SHSO stating the reason for cutting the lock and the procedure used to ensure the safety of personnel in the area.

10.3.5 Modification of Lockout/Tagout Procedure

Any modifications to the procedures described above or listed in greater detail elsewhere must be approved by the Project Health and Safety Manager (PHSM) and Project Manager.

10.4 Other Safety Procedures

10.4.1 Subcontractors

In general, subcontractors must adhere to the requirements of this manual, using their own only if they are more stringent.

- The project engineer must be familiar with the nature of subcontractors' work on site that may involve hazardous energy and ensure that they follow work practices that are at least as strict as this procedure.

- For any lockout/tagout requirements, the project engineer should review and approve all subcontractor work set up and apply his locks to the scheme.

10.4.2 Machinery

The following rules apply in general to all machinery. Check specific sections of this manual for additional information.

1. Never operate machinery or equipment without authority and/or adequate instructions from supervisory personnel.

2. Enclose completely all gears, belts, drive wheels, or other power transmission equipment.

3. Keep guards and safety devices in place at all times except when it is necessary to remove them for repair or service.

4. Lock out and tag out machinery before adjusting, oiling, or cleaning.

5. Clean up chips and filings by brushing from machinery, equipment, or work benches. Never use hands to brush chips, dust, or other material from work benches or equipment.

6. Do not wear loose clothing, neckties, gloves, rings, or bracelets when working with rotating machinery, mechanical equipment or motors. Keep hair well out of the way.

7. Wear necessary safety equipment when near operating equipment.

8. Never apply a wrench to moving machinery; lock out and tag out the machinery, then carefully remove all tools before starting again.

9. Do not leave machines unattended while they are running.

10. Do not distract machine operators while they are on-the-job.

11. Use a vise or clamp to secure objects for drilling or machining operations.

10.4.3 Hand Tools

Most injuries that occur while using hand tools are a result of presumed familiarity with the tool and/or carelessness. The following general rules apply to hand tools.

10.4.3.1 Wrenches. The following rules apply to wrenches:

- Be sure wrenches are adjusted to fit tightly, or are the correct size (open-end, box wrench or socket).

- Pull, do not push, when using a wrench.
- Do not over tighten a nut or bolt. The threads may be stripped or the bolt snapped.
- When stooping and using a large wrench on heavy work, personnel should brace themselves to avoid slipping or being thrown off balance. When using a wrench while lying on their backs, they must be careful not to let it slip and hit them in the face.
- Do not use a pipe or other wrench extension on a wrench handle to increase leverage. This often causes stripped threads, broken bolts, sudden loosening of nuts or bolts, slipping of the pipe from the wrench, and broken wrenches and fingers.
- When pulling on a wrench being used overhead, stand to the side.
- Place wrenches so that the pull will be on the stationary jaw.

10.4.3.2 Screwdrivers. The following rules apply to screwdrivers:

- Do not use screwdrivers with broken or rounded points or bent shafts.
- When using a screwdriver, place work on a solid object; never hold it in the palm of the hand.
- Keep the screwdriver shank directly over the screw head.
- Never use pliers or wrenches on the shanks of screwdrivers unless they are a type especially designed to withstand strain.

10.4.3.3 Saws. The following rules apply to saws:

- Use each type of saw only for the purposes for which it is intended.
- Start the cut carefully so that the saw will not "jump".
- Be sure that the materials to be cut are firmly supported or secured.

10.4.3.4 Hack Saws. The following rules apply to hack saws:

- Place the blade in the frame so the teeth point toward the end of the frame and away from the handle. Tighten the blade rigidly.
- Cut outward, and saw with straight, long strokes, using almost the whole blade. Ease pressure on the backward stroke.
- Judge cutting speed by the hardness of the metal. Forty to fifty strokes per minute is right for metals of average hardness. A faster rate may ruin the blade.

- Do not saw objects that are too hard. Test objects for hardness with the front or rear end of the blade.

10.4.3.5 Pliers. The following rules apply to pliers:

- Use pliers only when no other tool will do the job.
- Do not use pliers as wrenches.
- Use cutting pliers only for cutting soft metals, never on hardened metals. Never use them as nail pullers.
- When cutting wire that is under tension, be sure the wire will not fly inward. When cutting wire in rolls and on bales, loaded card, trucks, and boxes, use long- handled wire cutting pliers.

10.4.3.6 Hammers. The following rules apply to hammers:

- A sledge hammer is unsafe to use if it has a split handle or a loose or heavily chipped head.
- Sledge hammer heads should be dressed whenever they begin to check or mushroom.
- Select a sledge hammer of the proper weight for the work to be done. A sledge hammer so light that it bounces off the work is hazardous; one too heavy is hard to control and may cause body strain.
- Do not use claw hammers for striking objects such as cold chisels. They are designed for driving and drawing nails. Their shape, depth of face, and balance make them unsuitable for striking objects.

10.4.4 Power Tools. Power tools can be very dangerous. Users must be sure they know how to operate them properly. The following general rules apply:

- Know the power tool. Read the owner's operating manual carefully. Learn the tool's applications and limitations, as well as the specific potential hazards peculiar to it. Use the proper tool for the appropriate job.
- Use only grounded electrical tools, unless double insulated. If a tool is equipped with a three-prong plug, it should be plugged into a three-hole electrical receptacle or appropriate extension cord. Never remove the ground prong of a three-prong plug.
- Keep guards in place and in working order.
- Keep the work area clean; cluttered areas and benches invite accidents.

- Do not use an electric power tool in damp or wet locations.
- Keep all visitors a safe distance away from work areas.
- When not in use, store tools in dry, high, or locked locations.
- Do not force a tool; it will do the job better and safer at the rate for which is was designed.
- Use the right tool; do not force a small tool or attachment to do the job of a heavy-duty tool.
- Do not wear loose clothing or jewelry which may get caught in moving parts. Keep hair well out of the way. Wear rubber gloves and footwear when working outdoors under wet weather conditions or wet soil conditions with an electrical tool.
- Wear safety glasses. Wear a face mask or respirator if the cutting operation is dusty.
- Never carry a tool by the cord or yank it to disconnect it from a receptacle. Keep the cord away from heat, warm oil, and sharp oil.
- Use clamps or a vise to hold work. This is safer than using hands, and it frees both hands to operate the tool.
- Keep proper footing and balance at all times.
- Keep tools sharp and clean at all times for the best and safety performance.
- Disconnect tools when not in use.
- Remove adjusting keys and wrenches from the tool before connecting the tool to the source of power.
- Do not carry a plugged in tool with the finger on the switch.
- Use only approved, properly insulated, and inspected extension cords.
- Always examine both the cord and connection of an electrical power tool before using it. When using pneumatic hand tools, make sure the hose is properly connected and the key air valve closed until the gun is actually ready to use.
- When using compressed air:
  - Use only a sound, strong hose with secure couplings and connections.
  - Be sure there are not sharp points on metal hose parts.
  - Close the control valve in portable pneumatic tools before turning on air.

- Before changing one pneumatic tool for another, turn off the air control valve. Never kink the hose to stop air flow.
- Wear suitable goggles, mask, protective clothing, or safety devices.
- Never use air to blow dust or chips from the hair, clothing, or safety devices.
- Never point the hose at anyone.
- When using compressed air, see that no nearby workers are in line of air flow.
- All compressed air supplies used for blowing with air must by equipped with 30 psi regulators.

10.4.5 Electric Hand Tools

The following rules generally apply when using electric hand tools:

- Keep tools in good condition, cleaned, oiled, and repaired.
- Always use grounded or double insulated tools.
- Use only approved and inspected 3-wire extension cords.
- Always examine both the cord and connections carefully before using.
- Never jerk an extension cord out of the socket.
- Never hang an extension cord over nails or sharp edges. Do not not allow it to become kinked; do not leave it where a vehicle may run over it. Wire or insulation will be damaged.
- Do not patch the cord with tape. Rather, replace the cord.
- Wear goggles while using electric hand tools.
- Do not use electric tools in the presence of flammable vapors or gases.
- Store extension cords in a clean, dry place where they can lie loosely coiled.
- Remove all "trigger locks" from power hand tools. Do not use a tool if "trigger lock" is still functioning.
- When working outside with electric hand tools, do not use "trigger locks."
- Never use electric tools having worn or damaged cord, damaged plugs, defective switches; the defect might cause an electric shock.

10.4.6 Ladder Safety

The unsafe use of ladders can cause serious damage to the person climbing on it or to others nearby and can cause extensive damage to property. Below are rules that must be followed when working on or around ladders.

10.4.6.1 General. The following rules apply to safe ladder use in general.

- Never use a makeshift ladder, as they cause many accidents.
- Use the right length ladder for the job so as not to have to reach or work from an unsafe position.
- Check for cracked or damaged side rails. Check for cracked, loose, or missing rungs, steps, or cleats.
- Inspect for rough or splintered surfaces and loose, bent, or broken hardware, such as hinges, spreaders, or extension locks.
- In setting up a ladder, place it so the distance between the foot of the ladder and the base of the structure is approximately one fourth the distance from the base to the point of bearing.
- Make sure the feet of the ladder are firmly and evenly supported.
- Ladders leading to walkways or landings should extend at a minimum of 36 inches above the point of bearing.
- Be sure that stepladders are fully opened with the spreader locked. Place all legs at the same level on firm footing. Ladders with safety shoes are required. Never use any ladder or section of ladder that does not have required safety shoes. Never stand on top of any ladder.
- Always face a ladder and use both hands when climbing on or descending from one.

10.4.6.2 Climbing Ladders. Most ladder accidents are caused by the ladder falling or the climber losing balance and falling. Here are some important precautions:

- Make sure the ladder is not defective.
- Use a ladder with safety feet suitable for the floor or ground it stands on.
- If the ground is slippery, tie the ladder at the base or have someone hold it.
- If the ladder is placed before a doorway or entranceway, lock the door or have someone guard it. Protect the ladder base from heavy traffic, if necessary.
- When using a stepladder, make sure it is fully extended before climbing it.

- If a worker's shoes are muddy or otherwise slippery, they must be cleaned before climbing.
- Be sure the ladder is placed at a safe angle against the wall or other solid backing. An angle of about 75 degrees from the horizontal is required.
- Always face the ladder and hold on with both hands, whether climbing up or down.
- Carry tools on a tool belt or have tools and all other objects hoisted with a rope and bucket.
- Step toward the ends of a step. Do not place weight in the center of a step.

10.4.6.3 Working From Ladders. The following rules apply when working on or from ladders:

- Make sure the ladder is without defects and is placed securely against solid backing at a safe angle of about 75° degrees from the horizontal.
- Clean mud or greasy substances from shoes before climbing up to the work.
- Face the ladder and hold on with both hands whenever climbing up or down. Carry tools on a tool belt or hoist them with a rope.
- Work facing the ladder and hold on with one hand.
- Use a safety belt if the character of the work requires it.
- Do not reach out too far from the ladder in any direction; move the ladder as the work may require.
- Never splice together two ladders; get one long enough to do the job.
- Do not use a ladder as a horizontal member of a scaffold.
- When using ladders on roofs or other high places, lash them securely. Do not work in high wind.
- Use extreme caution when using tools requiring great force to operate. If a tool slips, you avoid being thrown from a ladder.

10.4.6.4 Stepladders. The following rules values apply in particular to stepladders:

- Make sure the ladder has no defects.
- Open the ladder wide enough so that the spreader locks itself in the fully opened position.
- If the ladder is placed before a doorway, lock the door or have someone guard it; protect the ladder base from traffic, if necessary.

- Place the ladder on a firm level base; if blocking is necessary, anchor both the blocking and the ladder, or tie it in place.

- Set up the ladder so that the objective can be reached easily; never lean far out from a ladder in any direction.

- Do not stand on the top of a step ladder; use a ladder tall enough to get the job done safely.

- Never use boxes or other makeshifts items to increase the height of a ladder; never set the ladder on loose or makeshift support.

- Tools should never be left on a ladder unless tool holders are provided.

Table 3-1
Interlock List

INTERLOCK	DESCRIPTION
I-1	Provides latching signal to main solenoid valve FC-400 WHEN: • FC-400 hand switch HS-401 is in AUTO position • Input latching signals are received from interlocks I-2, I-8, and I-9. IF HS-401 is taken out of "auto" or a delatching signal is received from any of the input interlocks, THEN I-1 will: • Close FC-400, terminating compressed air supply to the extraction well pumps • Delatch I-4, terminating operation of the vacuum blower V-200
I-2	Provides latching signal to start transfer pump P-100 WHEN: • P-100 hand switch HS-100 is in" auto" • I-1 de-latches, terminating compressed air supply to extraction well pumps • Oil-water separator T-100 water level is detected by LSL-100 and LSH-100 IF HS-100 is taken out of "auto", THEN I-2 will: • Stop P-100, discontinuing water removal from T-100 • I-1 de-latches, terminating compressed air supply to extraction well pumps • I-3 de-latches, stopping P-200 and discontinuing fluid transfer from T-200 to the oil-water separator IF T-100 water level is detected by LSHH-100, THEN I-2 will de-latch I-1, terminating compressed air to extraction pumps IF T-100 water level is detected by LSH-100, THEN I-2 will start P-100 IF T-100 water level is detected by LSL-100, THEN I-2 will stop P-100
I-3	Provides latching signal to start transfer pump P-200 WHEN: • P-200 hand switch HS-202 is in "auto" • An input latching signal is received from I-2, I-7, and I-9 • Air-water separator T-200 water level as detected by LSL-200 and LSH-200 IF HS-202 is taken out of "auto", THEN I-3 will stop P-200, discontinuing water removal from T-200 IF T-200 water level is detected by LSH-200, THEN I-3 will start P-200 IF T-200 water level is detected by LSL-200, THEN I-3 will stop P-200

Table 3-1
Interlock List

INTERLOCK	DESCRIPTION
I-4	Provides latching signal to start vacuum blower V-200 WHEN • V-200 hand switch HS-200 is in "auto" • An input latching signal is received from I-1 and I-5 • V-200 outlet temperature is detected by TSH-200 • V-200 outlet flow is detected by FSL-200 • Air-water separator T-200 water level is detected by LSHH-200 IF HS-200 is taken out of "auto", THEN I-4 will: • Stop V-200, discontinuing extraction vapors from the subsurface • De-latch I-6, stopping bio-venting blower V-300 IF outlet temperature becomes greater than 210°F as detected by TSH-200, THEN I-4 will stop operation of V-200 and de-latch I-6 terminating operation of bio-venting blower V-300 IF outlet flow is low as detected by FSL-200, THEN I-4 will stop operation of V-200 and de-latch I-6 terminating operation of bio-venting blower V-300 IF the water level in the air-water separator is high as detected by LSHH-200, THEN I-4 will stop operation of V-200 and de-latch I-6, terminating operation of bio-venting blower V-300
I-5	Provides latching signal to start air to heat exchanger X-200 WHEN: • X-200 hand switch HS-201 is in "auto" • Outlet temperature is greater than 120°F as detected by TSHL-200 IF HS-201 is taken out of "auto", THEN I-5 will: • Stop X-200, discontinuing cooling of the vapor stream • De-latch I-4, stopping vapor extraction blower V-200 IF outlet temperature is greater than 210°F as detected by TSHL-200, THEN I-5 will de-latch I-4, stopping vapor extraction blower V-200 IF outlet temperature is less than 120°F as detected by TSHL-200, THEN I-5 will stop X-200 to discontinue cooling of the airstream.

Table 3-1
Interlock List

INTERLOCK	DESCRIPTION
I-6	Provides latching signal to start bio-vent blower V-300 WHEN: • V-300 hand switch HS-300 is in "auto" • An input latching signal is received from I-4 • V-300 outlet temperature is less than the temperature set point as detected by TSH-300 • V-300 outlet flow is greater than the low flow set point as detected by FSL-300 IF HS-300 is taken out of "auto", THEN I-6 will stop V-300, discontinuing injection of vapors into the subsurface IF outlet temperature becomes greater than the high temperature set point as detected by TSH-300, THEN I-6 will stop operation of V-300 IF outlet flow becomes less than the low flow set point as detected by FSL-300, THEN I-6 will stop operation of V-300
I-7	Provides latching signal to start discharge transfer pump P-101 WHEN: • P-101 hand switch HS-101 is in "auto" • Water storage tank T-104 water level is detected by LS-101 and LSH-101 • P-101 outlet flow is not detected by FSL-101 IF HS-101 is taken out of "auto", THEN I-7 will: • Stop P-101 • De-latch I-2, stopping transfer pump P-100 • De-latch I-3, stopping transfer pump P-200 IF T-104 water level is detected by LSHH-101, THEN I-7 will de-latch I-2 and I-3 IF T-104 water level is detected by LSH-101, THEN I-7 will start P-101 IF T-104 water level is detected by LSL-101, THEN I-7 will stop P-101 IF outlet flow is not detected by FSL-101, THEN I-7 will stop operation of P-101 and de-latch I-2 and I-3

Table 3-2
Instrument List

Groundwater Extraction System

INSTRUMENT	DESCRIPTION	MANUFACTURER	MODEL	RANGE
PI-100A&B	Transfer Pump P-100 Outlet Pressure	Ashcroft	Q8996	0-60 psig
PI-102	Carbon Vessel Inlet Pressure	Ashcroft	733-03	0-30 psig
PSV-100	Discharge Pump P-101 Pressure Relief Valve	Plastomatic	RVDM	0-75 psid
PI-101	Discharge Pump P-101 Outlet Pressure	Ashcroft	723-08	0-100 psig
FE-101/FQI-101	Treated Groundwater Flow Rate/Quantity (Discharge to Storm Drain)	Neptune	47101307	0-30 gpm
PSV-102	Pressure Relief Valve	McDonald(McMaster-Carr)	4780K81	0-30 psid
LI-100	Level Sight Gauge Oil-Water Separator Product Reservoir	AT-A-Glance	Therma Gauge Type H	Empty to Full, 1/4 Tank Intervals
PI-104	Carbon Vessel Outlet Pressure	Dwyer	2001	0-1 H_2O
TI-100	Carbon Vessel Inlet Temperature	Trend	CR2204A	0-200° F
TI-101	Carbon Vessel Outlet Temperature	Trend	CR2204A	0-200° F
TI-102	Discharge Temperature After Pump P-101	Trend	CR2204A	0-200° F

Table 3-2
Instrument List

Vapor Extraction System

INSTRUMENT	DESCRIPTION	MANUFACTURER	MODEL	RANGE
PI-201 to PI-208	Wellhead Extracted Vapor Vacuum Indicators	Dwyer	2150	0-150 "H_2O
TI-209	Extracted Vapor Header Temperature (Inlet of T-200)	Trend	CR2204A	0-200° F
PI-209	Extracted Vapor Header Pressure Indicator	Dwyer	2150	0-150 "H_2O
PI-210	Extracted Vapor Header Pressure	Dwyer	2150	0-150 "H_2O
FE-209	Extracted Vapor Header Flow Indicator	Dwyer	DS-200-4 Gauge 2002	0-2 "H_2O
PSV-200	Vacuum Relief Valve	Knuckle Valve	215VH01	-15 "Hg
FE-210	Extracted Vapor Header Flow Indicator	Dwyer	DS-200-4 Gauge 2002	0-2 "H_2O
FE-211	Stack Vapor Flowrate	Dwyer	DS-200-4 Gauge 2005	0-5 "H_2O
PI-211	Vacuum Indicator on Tank T-200	USG	63148-62-9	0-30"Hg
TI-211	Temperature Indicator Discharge Vacuum Blower (outlet V-200)	Trend	CR2206E	0-300° F
TI-212	Temperature Indicator Discharge Heat Exchanger (outlet X-200)	Trend	CR2204A	0-200° F
TI-213	Temperature Indicator Discharge Carbon Vessels	Trend	CR2204A	0-200° F

Table 3-2
Instrument List

Bio-Venting System

INSTRUMENT	DESCRIPTION	MANUFACTURER	MODEL	RANGE
TI-301 tot TI-316	Bio-vent Wellhead Temperature Indicators	Trend	CR3205	20-240° F
PI-301 to PI-316	Bio-vent Wellhead Pressure Indicators	Ashcroft	723-03	0-30 psig
FE-301 to FE-316	Biovent Wellhead Flowrate Indicators	King Instrument Co.	75112215B-07	0-20 scfm
TI-317 to TI-319	Bio-vent Header Temperature Indicators	Trend	CR2211	0-250° F
PI-317 to PI-319	Bio-vent Header Pressure Indicators	Ashcroft	723-03	0-30 psig
FE-317 to FE-319	Bio-vent Header Pressure Indicators	King Instruments	5848 -256	0-20 scfm
PI-320	Bio-vent Blower Outlet Pressure Indicator	Marsh	16778	0-30 psig
PSV-300	Bio-vent Blower Outlet Pressure Relief Valve		14134	

Compressed Air System

INSTRUMENT	DESCRIPTION	MANUFACTURER	MODEL	RANGE
FC-400	Compressed Air Supply Solenoid Valve	JD Gould Co	22134	120V - 1" dia 5-15 psi
PI-400	Compressed Air Supply Pressure Indicator	Ashcroft	723-08	0-100 psig
PCV-400	Compressed Air Supply Pressure Regulator	Wilkerson	CB6-02-FM0BG95	0-125 psig
PSV-400	Pressure Relief Valve	Knuckle Valve	548 A01 H95M	60 psig 325 psig

Table 3-3
Control Device Set Points

Groundwater Extraction System

CONTROL DEVICE	DESCRIPTION	SET POINT
LSHH-103	Oil-Water Separator T-100 Product Level High-High	Normally Open
LSH-103	Oil-Water Separator T-100 Product Level High	Normally Open
LSL-100	Oil-Water Separator T-100 Water Level Low	Normally Open
LSH-100	Oil-Water Separator T-100 Water Level High	Normally Open
LSHH-100	Oil-Water Separator T-100 Water Level High-High	Normally Open
FSL-100	Transfer Pump P-100 Flow Low	Normally Open
PSH-100	Particulate Filters F-100 A/B Differential Pressure High	15 psid
PSHH-100	Particulate Filters F-100 A/B Differential Pressure High-High	20 psid
FSL-101	Transfer Pump P-101 Flow Low	Normally Open
LSL-101	Treated Water Storage Tank T-104 Water Level Low	Normally Open
LSH-101	Treated Water Storage Tank T-104 Water Level High	Normally Open
LSHH-101	Treated Water Storage Tank T-104 Water Level High-High	Normally Open
FSL-102	Free Product Pump P-102 Discharge Flow Low	Normally Open
LSHH-102	Free Product Tank T-101 Level High	Normally Open

Table 3-3
Control Device Setpoints

Vapor Extraction System

CONTROL DEVICE	DESCRIPTION	SETPOINT
TSHL-200	Air-to-Air Heat Exchanger X-200 Outlet Temperature High-Low	150/100° F
FSL-200	Vapor Extraction Blower V-200 Outlet Flow Low	Normally Open
LSL-200	Air-Water Separator T-200 Water Level Low	Normally Open
LSH-200	Air-Water Separator T-200 Water Level High	Normally Open
LSHH-200	Air-Water Separator T-200 Water Level High-High	Normally Open
TSH-200	Vapor Extraction Blower V-200 Outlet Temperature High	210° F

Bio-Venting System

CONTROL DEVICE	DESCRIPTION	SET POINT
FSL-300	Bio-Vent Blower V-300 Flow Rate Low	Normally Open
TSH-300	Bio-Vent Blower V-300 Outlet Temperature High	210° F

Compressed Air System

CONTROL DEVICE	DESCRIPTION	SET POINT
PSL-400	Air Compressor Receiving Tank T-400 Air Pressure Low	45 psi
PSHL-400	Air Compressor Receiving Tank T-400 Air Pressure High-Low	175 psi/150 psi

Table 4-1
Valve List

Groundwater Extraction System

VALVE	DESCRIPTION	NORMAL POSITION	TYPE	SIZE	MATERIAL
HV-100	Free Product Transfer Pump Outlet Isolation Valve	Open	Ball	1-inch	Brass
HV-101	Total Fluid Isolation Valve, Well RW-1	Open	Ball	1-inch	PVC
HV-102	Total Fluid Isolation Valve, Well RW-2	Open	Ball	1-inch	PVC
HV-103	Total Fluid Isolation Valve, Well RW-3	Open	Ball	1-inch	PVC
HV-104	Total Fluid Isolation Valve, Well RW-4	Open	Ball	1-inch	PVC
HV-105	Total Fluid Isolation Valve, Well RW-5	Open	Ball	1-inch	PVC
HV-106	Total Fluid Isolation Valve, Well RW-6	Open	Ball	1-inch	PVC
HV-107	Total Fluid Isolation Valve, Well RW-7	Open	Ball	1-inch	PVC
HV-108	Total Fluid Isolation Valve, Well RW-8	Open	Ball	1-inch	PVC
HV-109	Transfer Pump P-100 Inlet Valve	Open	Ball	1 ½-inch	PVC
HV-110	Storage Tank T-104 Outlet Shutoff Valve	Open	Ball	2-inch	PVC
HV-113	Particulate Filter F-100B Inlet Valve	Closed	Ball	1-inch	PVC
HV-114	Particulate Filter F-100B Outlet Valve	Closed	Ball	1-inch	PVC
HV-115	Particulate Filter F-100A Inlet Valve	Open	Ball	1-inch	PVC
HV-116	Particulate Filter F-100A Outlet Valve	Open	Ball	1-inch	PVC
HV-117	Liquid-Phase GAC (T-102) Inlet Valve	Open	Ball	1-inch	PVC

Table 4-1
Valve List

Groundwater Extraction System

VALVE	DESCRIPTION	NORMAL POSITION	TYPE	SIZE	MATERIAL
HV-118	Liquid Phase GAC (T-102) Outlet Valve	Closed	Ball	1-inch	PVC
HV-119	Liquid-Phase GAC (T-102) Intermediate Valve	Open	Ball	1-inch	PVC
HV-120	Liquid-Phase GAC (T-103) Outlet Valve	Closed	Ball	1-inch	PVC
HV-121	Not Used				
HV-122	Transfer Pump P-101 Outlet Valve	Throttling	Globe	1-inch	Brass
HV-123	Not Used				
HV-124	Oil-water Separator T-100 Oil Outlet Valve	Open	Ball	1-inch	Brass
HV-125	Liquid-Phase GAC (T-103) Inlet Valve	Open	Ball	1-inch	PVC
HV-126	Liquid-Phase GAC (T-103) Intermediate Valve	Open	Ball	1-inch	PVC
XV-101	Total Fluid Pump WP-101 Outlet Check Valve (Vendor)	One-way	Ball-Check	1-inch	PVC
XV-102	Total Fluid Pump WP-102 Outlet Check Valve (Vendor)	One-way	Ball-Check	1-inch	PVC
XV-103	Total Fluid Pump WP-103 Outlet Check Valve (Vendor)	One-way	Ball-Check	1-inch	PVC
XV-104	Total Fluid Pump WP-104 Outlet Check Valve (Vendor)	One-way	Ball-Check	1-inch	PVC
XV-105	Total Fluid Pump WP-105 Outlet Check Valve (Vendor)	One-way	Ball-Check	1-inch	PVC
XV-106	Total Fluid Pump WP-106 Outlet Check Valve (Vendor)	One-way	Ball-Check	1-inch	PVC
XV-107	Total Fluid Pump WP-107 Outlet Check Valve (Vendor)	One-way	Ball-Check	1-inch	PVC
XV-108	Total Fluid Pump WP-108 Outlet Check Valve (Vendor)	One-way	Ball-Check	1-inch	PVC
XV-109	Oil-Water Separator T-100 Inlet Check Valve	One-way	Flapper	1-inch	Brass

Table 4-1
Valve List

Groundwater Extraction System

VALVE	DESCRIPTION	NORMAL POSITION	TYPE	SIZE	MATERIAL
XV-110	Transfer Pump P-100 Outlet Check Valve	One-way	Flapper	1-inch	PVC
XV-111	Transfer Pump P-101 Outlet Check Valve	One-way	Flapper	1-inch	PVC
XV-112	Not Used				
AP-101	Total Fluid Wellhead RW-1 Sample Port	Closed	Ball	1/4-inch	PVC
AP-102	Total Fluid Wellhead RW-2 Sample Port	Closed	Ball	1/4-inch	PVC
AP-103	Total Fluid Wellhead RW-3 Sample Port	Closed	Ball	1/4-inch	PVC
AP-104	Total Fluid Wellhead RW-4 Sample Port	Closed	Ball	1/4-inch	PVC
AP-105	Total Fluid Wellhead RW-5 Sample Port	Closed	Ball	1/4-inch	PVC
AP-106	Total Fluid Wellhead RW-6 Sample Port	Closed	Ball	1/4-inch	PVC
AP-107	Total Fluid Wellhead RW-7 Sample Port	Closed	Ball	1/4-inch	PVC
AP-108	Total Fluid Wellhead RW-8 Sample Port	Closed	Ball	1/4-inch	PVC
AP-109	Nor Used				
AP-110	GAC Outlet Sample Port	Closed	Ball	1/4-inch	PVC
AP-111	GAC Inlet Sample Port	Closed	Ball	1/4-inch	PVC
AP-112	T-102 Outlet Sample Port	Closed	Ball	1/4-inch	PVC
AP-113	T-103 Outlet Sample Port	Closed	Ball	1/4-inch	PVC

Table 4-1
Valve List

Vapor Extraction System

VALVE	DESCRIPTION	NORMAL POSITION	TYPE	SIZE	MATERIAL
HV-201	Vapor Extraction Well RW-1 Isolation Valve	Throttling	Ball	2-inch	PVC
HV-202	Vapor Extraction Well RW-2 Isolation Valve	Throttling	Ball	2-inch	PVC
HV-203	Vapor Extraction Well RW-3 Isolation Valve	Throttling	Ball	2-inch	PVC
HV-204	Vapor Extraction Well RW-4 Isolation Valve	Throttling	Ball	2-inch	PVC
HV-205	Vapor Extraction Well RW-5 Isolation Valve	Throttling	Ball	2-inch	PVC
HV-206	Vapor Extraction Well RW-6 Isolation Valve	Throttling	Ball	2-inch	PVC
HV-207	Vapor Extraction Well RW-7 Isolation Valve	Throttling	Ball	2-inch	PVC
HV-208	Vapor Extraction Well RW-8 Isolation Valve	Throttling	Ball	2-inch	PVC
HV-209	VES Main Header Isolation Valve	Open	Ball	4-inch	PVC
HV-210	Not Used				
HV-211	Air-Water Separator Water Outlet Valve	Open	Ball	1-inch	PVC
HV-212	Not Used				
HV-213	Vapor-Phase GAC T-202 Inlet Valve	Closed	Ball	4-inch	PVC
HV-214	Vapor-Phase GAC T-201 Inlet Valve	Open	Ball	4-inch	PVC
HV-215	Vapor-Phase GAC T-201 Outlet Valve	Closed	Ball	4-inch	PVC
HV-216	Vapor-Phase GAC T-202 Outlet Valve	Open	Ball	4-inch	PVC
HV-217	VES Blower V-200 Dilution Valve	Throttling	Ball	3-inch	Brass
HV-218	Not Used				

Table 4-1
Valve List

Vapor Extraction System

VALVE	DESCRIPTION	NORMAL POSITION	TYPE	SIZE	MATERIAL
HV-219	Not Used				
HV-220	Not Used				
HV-221	Vapor-Phase GAC T-201 Bypass Valve	Closed	Ball	4-inch	PVC
HV-222	Vapor-Phase GAC T-201 Outlet Valve	Open	Ball	4-inch	PVC
XV-201	Transfer Pump P-200 Outlet Check Valve	One-way	Flapper	1-inch	Brass
AP-201	Vapor Extraction Well RW-1 Sample Port Valve	Closed	Swageloc	1/4-inch	SS
AP-202	Vapor Extraction Well RW-2 Sample Port Valve	Closed	Swageloc	1/4-inch	SS
AP-203	Vapor Extraction Well RW-3 Sample Port Valve	Closed	Swageloc	1/4-inch	SS
AP-204	Vapor Extraction Well RW-4 Sample Port Valve	Closed	Swageloc	1/4-inch	SS
AP-205	Vapor Extraction Well RW-5 Sample Port Valve	Closed	Swageloc	1/4-inch	SS
AP-206	Vapor Extraction Well RW-6 Sample Port Valve	Closed	Swageloc	1/4-inch	SS
AP-207	Vapor Extraction Well RW-7 Sample Port Valve	Closed	Swageloc	1/4-inch	SS
AP-208	Vapor Extraction Well RW-8 Sample Port Valve	Closed	Swageloc	1/4-inch	SS
AP-209	Vapor Phase GAC Inlet Sample Port Valve	Closed	Swageloc	1/4-inch	SS
AP-210	Vapor-Phase GAC Midpoint Sample Port Valve	Closed	Swageloc	1/4-inch	SS
AP-211	Vapor-Phase GAC Outlet Sample Port Valve	Closed	Swageloc	1/4-inch	SS

Table 4-1
Valve List

Bio-Venting System

VALVE	DESCRIPTION	NORMAL POSITION	TYPE	SIZE	MATERIAL
HV-301	Injection Wellhead IW-1 Isolation Valve	Open	Ball	1-inch	PVC
HV-302	Injection Wellhead IW-2 Isolation Valve	Open	Ball	1-inch	PVC
HV-303	Injection Wellhead IW-3 Isolation Valve	Open	Ball	1-inch	PVC
HV-304	Injection Wellhead IW-4 Isolation Valve	Open	Ball	1-inch	PVC
HV-305	Injection Wellhead IW-5 Isolation Valve	Open	Ball	1-inch	PVC
HV-306	Injection Wellhead IW-6 Isolation Valve	Open	Ball	1-inch	PVC
HV-307	Injection Wellhead IW-7 Isolation Valve	Open	Ball	1-inch	PVC
HV-308	Injection Wellhead IW-8 Isolation Valve	Open	Ball	1-inch	PVC
HV-309	Injection Wellhead IW-9 Isolation Valve	Open	Ball	1-inch	PVC
HV-310	Injection Wellhead IW-10 Isolation Valve	Open	Ball	1-inch	PVC
HV-311	Injection Wellhead IW-11 Isolation Valve	Open	Ball	1-inch	PVC
HV-312	Injection Wellhead IW-12 Isolation Valve	Open	Ball	1-inch	PVC
HV-313	Injection Wellhead IW-13 Isolation Valve	Open	Ball	1-inch	PVC
HV-314	Injection Wellhead IW-14 Isolation Valve	Open	Ball	1-inch	PVC
HV-315	Injection Wellhead IW-15 Isolation Valve	Open	Ball	1-inch	PVC
HV-316	Injection Wellhead IW-16 Isolation Valve	Open	Ball	1-inch	PVC
HV-317	Air Injection Header Isolation Valve	Throttling	Ball	3-inch	Brass
HV-318	Air Injection Header Isolation Valve	Throttling	Ball	3-inch	Brass

Table 4-1
Valve List

Bio-Venting System

VALVE	DESCRIPTION	NORMAL POSITION	TYPE	SIZE	MATERIAL
HV-319	Air Injection Header Isolation Valve	Throttling	Ball	3-inch	Brass
HV-320	Flow Blowoff Valve	Throttling	Ball	3-inch	Brass
HV-321 to HV-330	Not Used				
HV-331	Injection Well IW-1 Flow Control Valve	Throttling	Gate	1-inch	Brass
HV-332	Injection Well IW-2 Flow Control Valve	Throttling	Gate	1-inch	Brass
HV-333	Injection Well IW-3 Flow Control Valve	Throttling	Gate	1-inch	Brass
HV-334	Injection Well IW-4 Flow Control Valve	Throttling	Gate	1-inch	Brass
HV-335	Injection Well IW-5 Flow Control Valve	Throttling	Gate	1-inch	Brass
HV-336	Injection Well IW-6 Flow Control Valve	Throttling	Gate	1-inch	Brass
HV-337	Injection Well IW-7 Flow Control Valve	Throttling	Gate	1-inch	Brass
HV-338	Injection Well IW-8 Flow Control Valve	Throttling	Gate	1-inch	Brass
HV-339	Injection Well IW-9 Flow Control Valve	Throttling	Gate	1-inch	Brass
HV-340	Injection Well IW-10 Flow Control Valve	Throttling	Gate	1-inch	Brass
HV-341	Injection Well IW-11 Flow Control Valve	Throttling	Gate	1-inch	Brass
HV-342	Injection Well IW-12 Flow Control Valve	Throttling	Gate	1-inch	Brass
HV-343	Injection Well IW-13 Flow Control Valve	Throttling	Gate	1-inch	Brass
HV-344	Injection Well IW-14 Flow Control Valve	Throttling	Gate	1-inch	Brass

Table 4-1
Valve List

Bio-Venting System

VALVE	DESCRIPTION	NORMAL POSITION	TYPE	SIZE	MATERIAL
HV-345	Injection Well IW-15 Flow Control Valve	Throttling	Gate	1-inch	Brass
HV-346	Injection Well IW-16 Flow Control Valve	Throttling	Gate	1-inch	Brass

Table 4-1
Valve List

Compressed Air System

VALVE	DESCRIPTION	NORMAL POSITION	TYPE	SIZE	MATERIAL
HV-401	Total Fluid Pump WP-101 Air Supply Valve	Open	Ball	½-inch	PVC
HV-402	Total Fluid Pump WP-102 Air Supply Valve	Open	Ball	½-inch	PVC
HV-403	Total Fluid Pump WP-103 Air Supply Valve	Open	Ball	½-inch	PVC
HV-404	Total Fluid Pump WP-104 Air Supply Valve	Open	Ball	½-inch	PVC
HV-405	Total Fluid Pump WP-105 Air Supply Valve	Open	Ball	½-inch	PVC
HV-406	Total Fluid Pump WP-106 Air Supply Valve	Open	Ball	½-inch	PVC
HV-407	Total Fluid Pump WP-107 Air Supply Valve	Open	Ball	½-inch	PVC
HV-408	Total Fluid Pump WP-108 Air Supply Valve	Open	Ball	½-inch	PVC
HV-409	Main Air Supply Shutoff Valve	Open	Ball	½-inch	Brass
HV-410	Coalescing Air Filter Inlet Valve	Open	Ball	½-inch	
HV-411	Coalescing Air Filter Outlet Valve	Open	Ball	½-inch	
HV-412	Coalescing Air Filter Bypass Valve	Open	Ball	½-inch	Brass
HV-413	Main Air Supply Isolation Valve	Open	Ball	1-inch	Brass
HV-414	Air Compressor Condensate Outlet Valve	Open	Ball	½-inch	Brass

Table 5-1
Preventative Maintenance Schedule

Groundwater Extraction System

EQUIPMENT	TAG NO.	WEEKLY	MONTHLY	ANNUALLY
Piping		- Check for leaks		
Valves		- Check for cracks and leaks		- Perform function check
Wellheads	RW-1 to RW-8	- Check for cracks - Remove free liquid and foreign material		
Total fluid recovery pumps (AP-4 Ops Manual, Ch 6)	WP-101 to WP-108	- Inspect piping, hoses for leaks, corrosion	- Inspect pump casing for holes - Clean pump cycle counter - Drain air filters on air line - Check regulator setting	- Steam clean pumps **biannually** -Clean the interior of pumps and check for wear on floats - Lubricate "O" rings
Oil-water separator (CSEP Inst, Ops, & Miant Manual, Sec 4)	T-100	- Check for leaks - Adjust skimmers as needed for product skimming - Check for sludge and bio build up in separator	- Check product holding tank for water build up (if water in product holding tank transfer product back through separator for complete separation and adjust skimmers to skim product only)	- Drain and steam clean separator and plate packs biannually
Particulate filters	F-101A/B	- Check for leaks & wear - Change filter if PDI-100 exceeds 15 psi		
Transfer pumps	P-100 P-101 P-102	- Check for leaks and wear	- Check for leaks and wear	
GAC units	T-102 T-103	- Check for leaks and wear - Check PI-103 & PI-104 for pressure build up and back flush as needed		

Table 5-1
Preventative Maintenance Schedule

Groundwater Extraction System

EQUIPMENT	TAG NO.	WEEKLY	MONTHLY	ANNUALLY
Water storage tank	T-104	- Check for leaks and wear - Check paint coatings	- Check for bacterial build up in tank - Check/clean vents - Inspect bungs for damage and wear	- Clean tank with pressure wash
Flowmeter/Totalizer	FE/FQI-101	- Check for leaks	- Check for operation of gauge - Clean housing and remove accumulations of dirt, grease, or chemical residue	- Disconnect and clean internal gears on gauge
Gauges	PDI-100 PI-100 PI-101 PI-102 PI-104F TI-100 TI-101 TI-102	- Check for cracks, leaks, and wear		- Perform function/calibration check
Level sensors	LSHH-100 LSH-100 LSL-100 LSHH-101 LSH-101 LSL-101 LSHH-102			- Remove and check for wear - Remove and clean to remove accumulations of dirt, grease, or chemical residue - Test sensors for operation

Table 5-1
Preventative Maintenance Schedule

Vapor Extraction System

EQUIPMENT	TAG NO.	WEEKLY	MONTHLY	ANNUALLY
Air-water separator	T-200	- Check for leaks	- Check sight glass and clean as necessary	Check for wall coating damage
Transfer pump	P-200	- Check for leaks and wear	- Check for leaks and wear	
Vacuum blower	V-200	- Check oil level (blower & motor) - Check for hot spots, vibrations, and noise - Check motor exterior for cleanliness - Lubricate drive end bearings	- Inspect filters, change or clean as needed - Inspect belts, change as needed - Change oil (**every 6 weeks**)	- Change gearbox oil (**semi-annually**)
Air-Air heat exchanger	X-200	- Check for leaks - Check fins and clean as needed	- Check and clean inlet filter, as needed	- Clean air passages (**semi-annually**)
GAC units	T-201 T-202	- Check for leaks and wear		
Gauges	PI-209 PI-210 PI-211 TI-209 TI-211 TI-212 TI-213 FE-209 FE-210 FE-211	- Check for cracks, leaks, signs of need for recalibration		- Perform function/calibration check

Table 5-1
Preventative Maintenance Schedule

Bio-Venting System

EQUIPMENT	TAG NO.	WEEKLY	MONTHLY	ANNUALLY
Piping		- Check for leaks		
Valves		- Check for cracks and leaks		- Perform function check
Wellheads	IW-1, IW-2 IW-3, IW-4 IW-5, IW-6 IW-7, IW-8 IW-9, IW-10 IW-11, IW-12 IW-13, IW-14 IW-15, IW-16	- Check for cracks - Remove free liquid and foreign material		
Bio-vent blower	V-300	- Check oil level (blower and motor) - Check for hot spots, vibrations, and noise - Check motor exterior for cleanliness - Lubricate drive end bearings	- Inspect filters, change/clean as needed - Inspect belts, change, as needed - Change oil (**every 6 weeks**)	- Change gearbox oil (**semi annually**)
Gauges	TI-301 to TI-319 PI-301 to PI-320 FE-301 to FE-319	- Check for cracks, leaks, signs of need for recalibration		- Perform function/calibration check

Table 5-1
Preventative Maintenance Schedule

Compressed Air System

EQUIPMENT	TAG NO.	WEEKLY	MONTHLY	ANNUALLY
Air Compressor	K-400	- Clean off dust - Clean filters (F-400/401), as required - Check V-belt for tightness - Check safety valves - Check oil level, add, as needed - Manually drain tank - Clean inter cooler	- Tighten nuts and cap screws - Clean valves, as required - Check pressure relief valves (PSV-400) - Blow off motor windings - Clean aftercooler exterior - Check drain and low oil monitor function - Clean regulator PCV-400 - Check system for air leaks with soap solution	- Repack ball bearing motor grease - Inspect intercooler tubes for wear, buildup

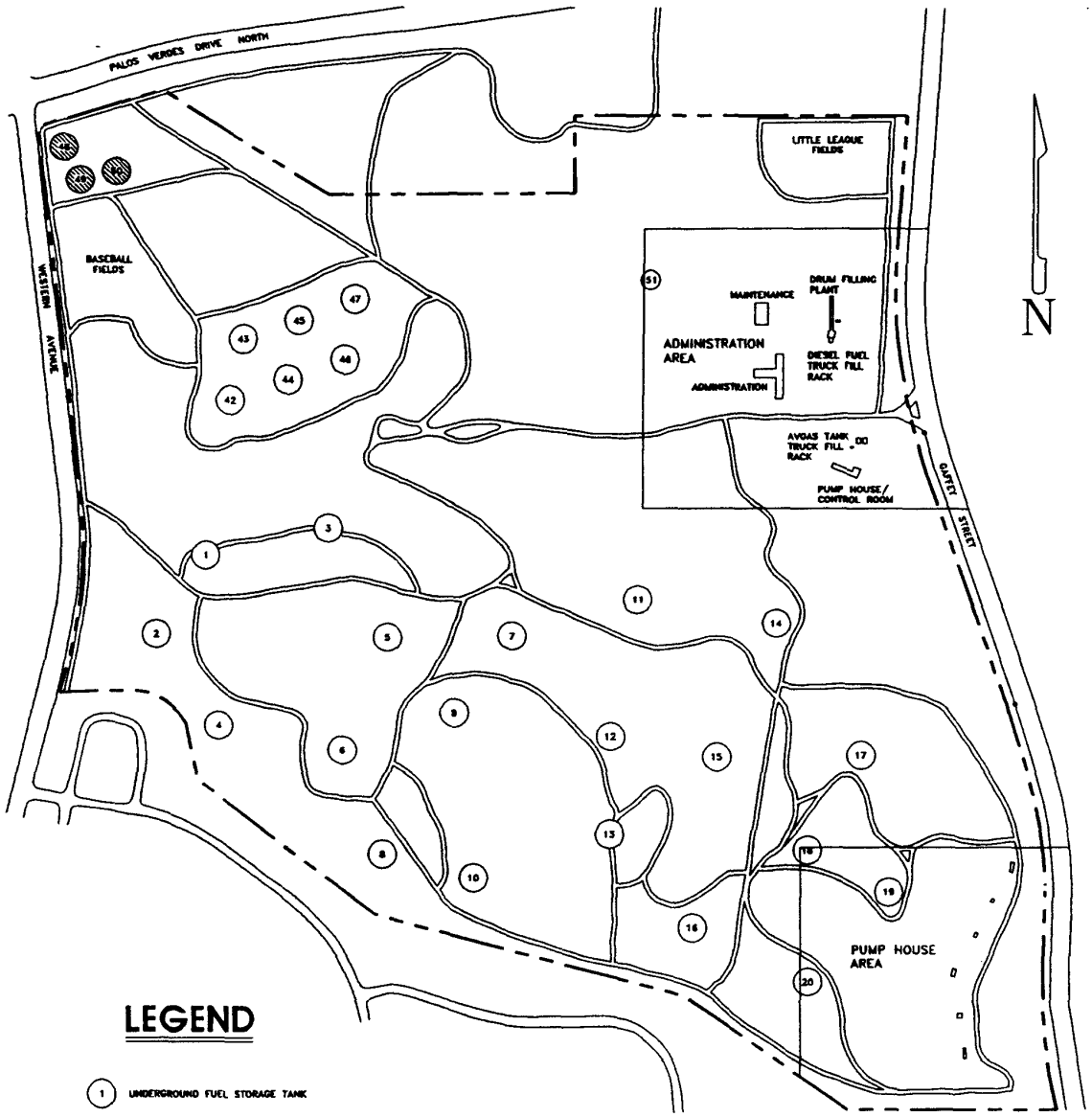
Table 6-1
COMPLIANCE MONITORING SAMPLING PLAN

Sample Type	Frequency	Location	Analysis	QC Samples
Liquid GAC effluent Inter-GAC (wastewater) Note: For inter-GAC sample, only weekly analyses apply	Weekly	GAC effluent sampling port AP-110 Inter-GAC sampling port AP-111	TPH by EPA 8015M BTEX by 8020 Ethylene dibromide by EPA 504 Oil/grease by EPA 413.1 Temperature pH	1 field duplicate per 10 samples
	Monthly		Chloride by SM4500-CIC Sulfate by EPA 375.4 Sulfides by EPA 376.2 Nitrogen, ammonia by EPA 350.2 Nitrogen, total kjeldahl by EPA 351.3 Ttotal dissolved solidsby EPA 160.1 Tturbidity by EPA 180.1	1 field duplicate per 10 samples
	Quarterly		Ttotal lead by EPA 7421 Ssuspended solids by EPA160.2 Ssettleable solids by EPA 160.5	1 field duplicate per 10 samples
	Annually		Ttoxicity by LC50 Pphenol by EPA 420.1 Pphenolic compounds by EPA 604 BOD (20°C) by EPA 405.1	1 field duplicate per 10 samples
Vapor GAC influent, inter-GAC, and GAC effluent (air)	Weekly	Sampling ports AP-201 , AP-202, and AP-203.	VOCs by GA-90	
Groundwater	Quarterly	Monitoring wells without measurable product	TPH by EPA 8015 Aaromatic hydrocarbons by EPA602 Eethylene dibromide by EPA 504 Ttotal lead by EPA 7421	1 field duplicate per 10 samples

TABLE 8-1 TRAINING RECORD DOCUMENTATION					
TRAINING	DATE	CERTIFICATE ON FILE	DATE	INSTRUCTOR	INITIALS
40-Hour OSHA					
8-Hour Refresher					
First Aid & CPR					
PIR (Incident Reporting)					
Confined Space Entry					
Lockout/Tagout					
Hazard Communication					
Blood-borne Pathogen					
Competent Person					
8-Hour Supervisor					
24-Hour OJT					
Physical Exam					
Respirator Fit Test					
Process Operation					

Employee Signature

Project Engineer Signature



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APPROX SCALE IN FEET

GROUNDWATER TECHNOLOGY, INC.

DFSP-AF1

DRAFTED 10/18/93
REVISED 2/17/97

D.F.S.P./SAN PEDRO
3171 GAFFEY STREET
SAN PEDRO, CA
830011085

SITE MAP
FIGURE 1

10. Attached is the EXCEL spreadsheet for Clause B35 SERVICES TO BE FURNISHED AND PRICES. After completing the proposed cost data, the file should be copied on to CD-R media and included with the OFFEROR SUBMISSION PACKAGE.

15B. **NAME OF CONTRACTOR/OFFEROR**	15C. **DATE SIGNED**	16B. **UNITED STATES OF AMERICA**	16C. **DATE SIGNED**
BY _____ *(Signature of person authorized to sign)*		BY _____ *(Signature of Contracting Officer)*	

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